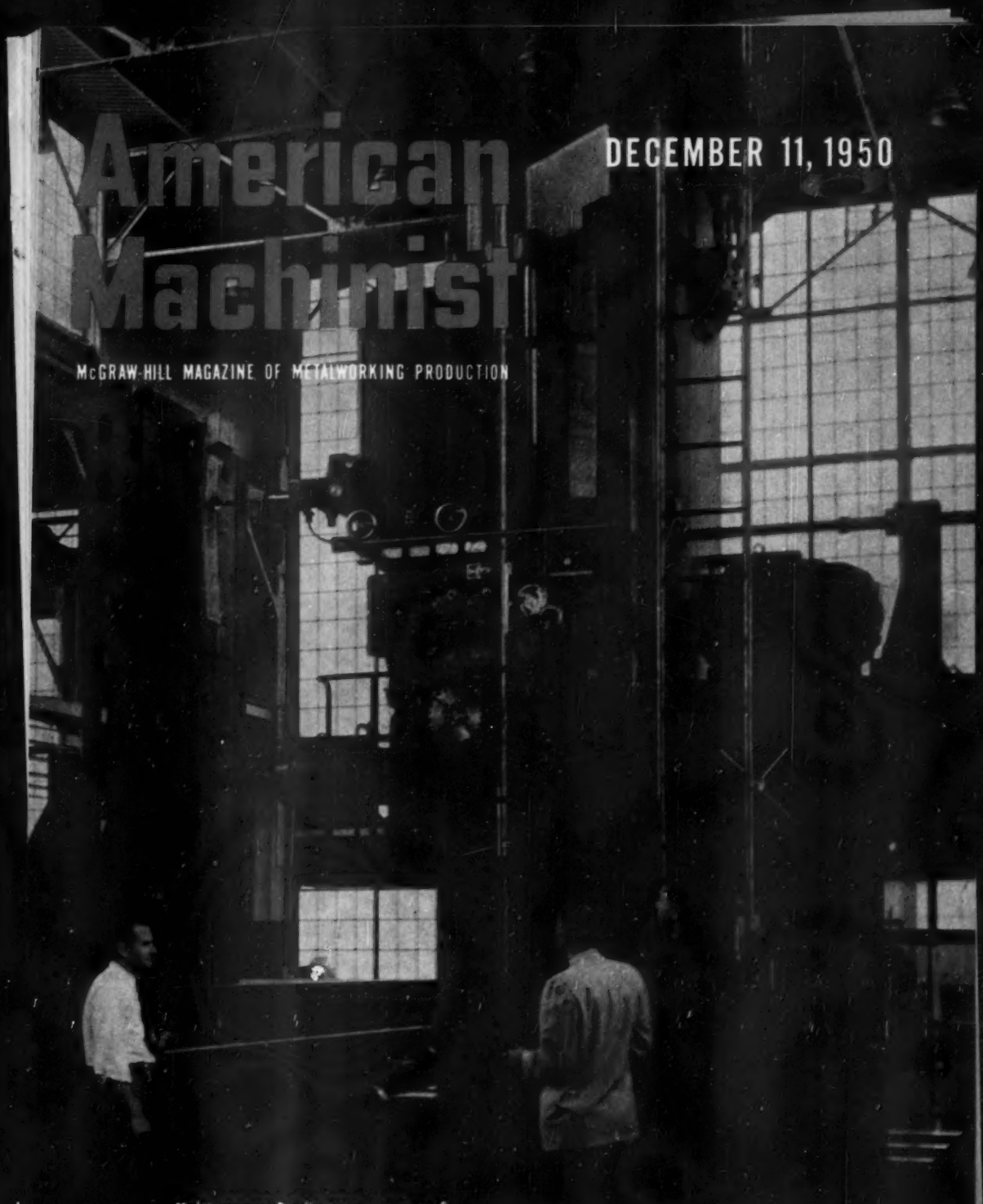
American Machinist

DECEMBER 11, 1950

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Multi-process Duplicator — see page 2

PRECISION PROGRESSIVE DIES • TOOLS FOR DIE CASTING

44 different parts

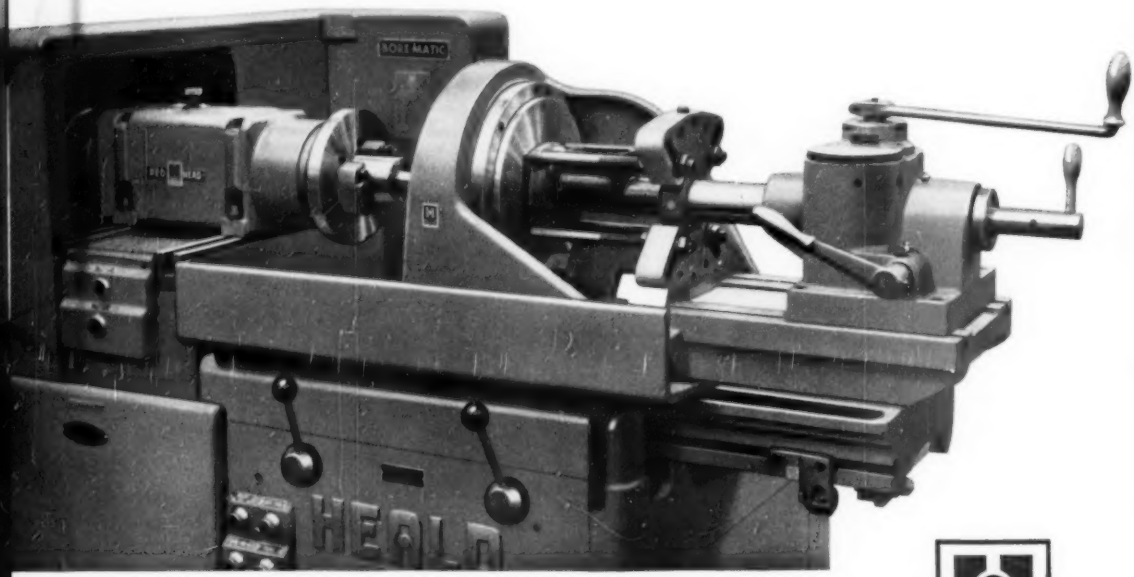
from 1 Heald Bore-Matic

That's the kind of *versatility* that pays off in high production, with minimum capital investment.

In this case, an electrical equipment manufacturer needed a machine to borize 44 different motor end frames. A tough assignment? Not for Heald engineering.

The result is shown below—a Heald Model 221 Bore-Matic, equipped with multiple-position tooling and a flexible, wide-range work-holding fixture. The rotating tool block is adjustable to the various rabbet diameters and the interchangeable boring bars are adjustable to the various depths and bearing hole sizes. The work-holding fixture is equally flexible—with interchangeable locating adapters, and adjustable housing with basic locating and clamping units, and a retractable centering plug which engages the bearing hole.

Your requirements are different, of course. But *whatever* the job, Heald engineering can point the way to faster, easier, lower-cost production. Remember—when it comes to precision finishing, it pays to come to Heald.



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American Machinist

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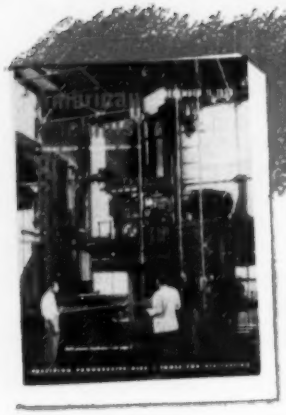
Chips and QUIPS



Versatool . . . Our cover shows the newest and largest Giddings & Lewis planer-type underarm machine on an automotive body-die job. The machine has an electrically operated tracer-control attachment, so can handle a range of die-sinking and profiling as well as boring, milling, and drilling. The new power-operated underarm spindle-support attachment can be used independently as a shaper ram for tricky jobs, as a spindle support out to 60 in., or as a support for angular milling attachments to bore, mill or drill at right angles to the spindle at any point. Details were in *AM* Nov. 13.

Washer-drive Lap . . . Valve assemblies, 15 at a time, are lapped in a home-made bench unit at Vapor Heating Corp. A washing-machine transmission provides motive power and drives one spindle directly. Two heads, each with 7 spindles, may be engaged or disengaged for loading simply by moving the unit toward or away from the center spindle. Louis Gross, machine-shop foreman at Vapor Heating, tells about it—with pictures.

Addendum . . . Several readers wrote, after Part I of our Special Report, "How to Work Tool & Die Steels" (*AM*, Oct. 16): "Wonderful; just what we've needed! Now, if you'll only give us a list of types, showing under each type who makes it, what it's called, how it varies from other trade-named steels . . . " Well, that's what Associate Editor Ashburn has been doing—and it's in this issue. Quite a lot of work to tabulate, but we think you'll find it very useful.

Gases . . . Good Carburizing Practice, Part 4, deals with "How Carburizing Gases Should Flow". T. A. Frischman, Chief metallurgist, Axle Div., Eaton Mfg. Co., will tell you why and how the flow of carburizing gases in heat-treating furnaces must be controlled to furnish not only the right amount of carbon to the steel, but also to obtain proper performance generally.

Electronic Parts . . . With the advent of high-production tooling, the cost of making television parts has been cut 75%. John Voelkert Metal Stampings, Inc., a leader in this new industry, reveals the details of sectionally built dies with up to 16 stations.

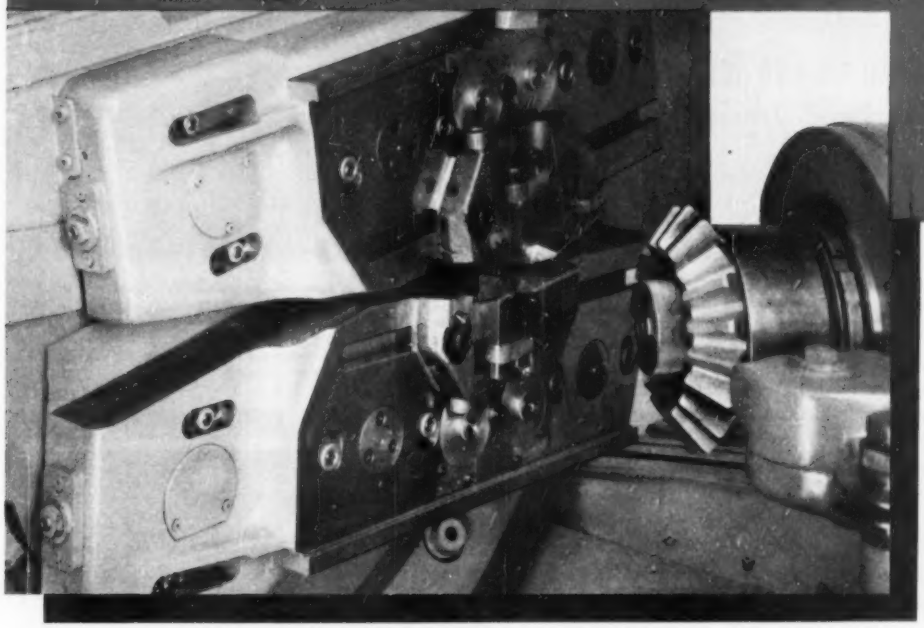
Induced Saving . . . W. Yeakel, partner at Northwest Bolt & Nut Co., Seattle, tells of doubled production of heads on large bolts by combining induction heat and a versatile fixture. Here a newer process—induction heating—was combined with an automatic feeder capable of handling a variety of diameters and lengths to increase production 150% and halve equipment.

Fifty Years . . . Half a century ago, the Gray & Prior Machine Company began operations in Hartford, Conn. Shortly afterward, the company began regular advertising in *American Machinist*, using only that publication for advertising at that time. Robert Gray, son of the founder, quotes his father as considering *AM* the most effective advertising medium ever used by the company and attributing early success of the business, in large measure, to that advertising. Now, 50 years later, Gray & Prior is once again utilizing *AM* as its primary advertising medium.

Coming . . . This year, the final issue of *American Machinist* is dated Christmas Day. To mark it we'll have a special cover painting we think you'll like . . . Our lead article is also appropriately chosen; it deals with Christmas-tree slotting. There'll also be a Special Report on high-temperature steels, a description of a targeting fixture at Fairchild Aviation, two stories on forming pipe coils, articles on cutting-die troubles, lapping, steam painting, machining the Buick crankcase. There'll be more on carburizing and a spread of Shop Shots too—quite a Christmas present, considered in toto.

GREELEYITE . . . W. R. Yeakel, partner in Northwest Bolt & Nut Company, Seattle, is actually a native of Chicago. He attended Wayland Academy, Beaver Dam, Wis., but his advanced education he got in the University of Hard Knocks. He went West only 23 years ago when he purchased the company. At that time, Northwest Bolt had only three men on the payroll and occupied a very small, one-story building. The company now employs about 60 people, with an office force of 15, and follows a policy of continual modernization of buildings and equipment. Thus it was that induction heating was installed, and Mr. Yeakel herewith describes fixturizing of the equipment. He says they are highly pleased with the unit and its production.

CONIFLEX® GEARS HAVE LOCALIZED TOOTH BEARING



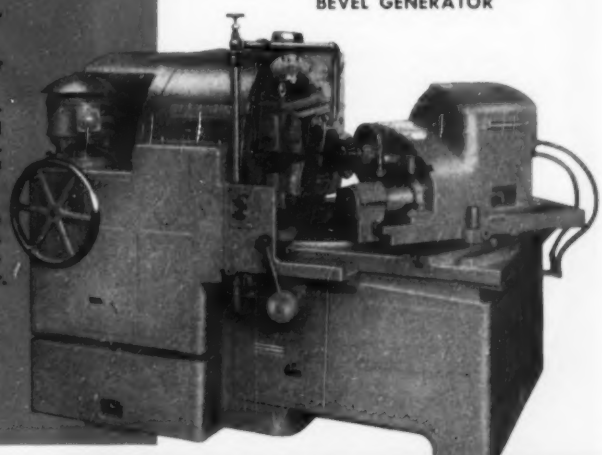
The "built-in" feature of localized tooth bearing on Coniflex gears is easily set through simple dial adjustments only on the face of the tool slides.

Coniflex gears are superior to ordinary straight bevels:

- in assembly, for they have wider tolerances for positioning.
- in operation, for they are built to provide even distribution of the load along the tooth surfaces without dangerous concentration at the ends of the tooth.

This "built-in" feature on the gear teeth can be obtained only on Coniflex gears cut on Gleason machines such as the Gleason No. 14 Straight Bevel Generator.

GLEASON No. 14 STRAIGHT BEVEL GENERATOR



GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

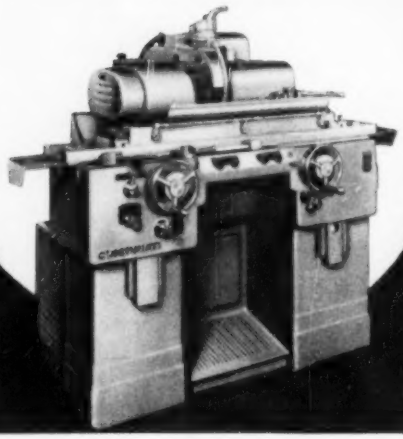
Builders of Bevel Gear Machinery for Over 85 Years

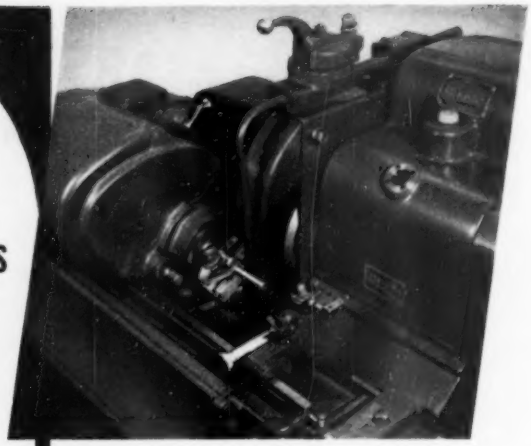
IDEAS FOR REPLACEMENT

...with an Eye for Lower Costs of Small Precision Parts

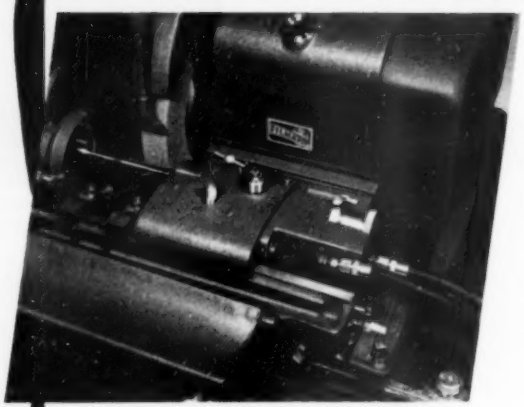
You wouldn't go fishing for red snapper with a whale boat. Yet it's a common practice—and a costly one—to machine small parts on oversized equipment. There's no need to perpetuate this practice in precision grinding. Cincinnati builds a small grinding machine—4" Plain Hydraulic—to handle the precision grinding operations on small parts at the lowest possible cost. Several examples of typical jobs are shown here. And notice the adaptability of these machines for specialized work. ¶ Your retooling program will benefit in many ways from installation of CINCINNATI FILMATIC 4" Plain Hydraulic Grinders. You can count on sizing within a tenth . . . extra high-quality finish . . . elimination of spindle bearing maintenance (an advantage offered by Cincinnati's exclusive FILMATIC spindle bearings). Complete data may be obtained by writing for literature, or look in Sweet's for brief specifications.

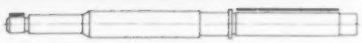
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO





Crankshafts with .030" throw ground from the solid. Cincinnati Application Engineers tooled up a 4" Plain Hydraulic for this job with a work holding fixture featuring repetitive stopping for convenience in loading.

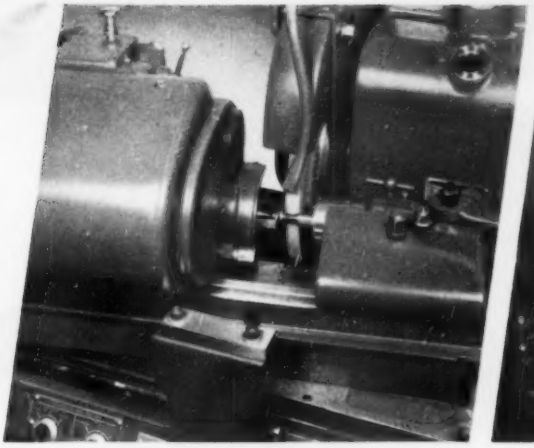


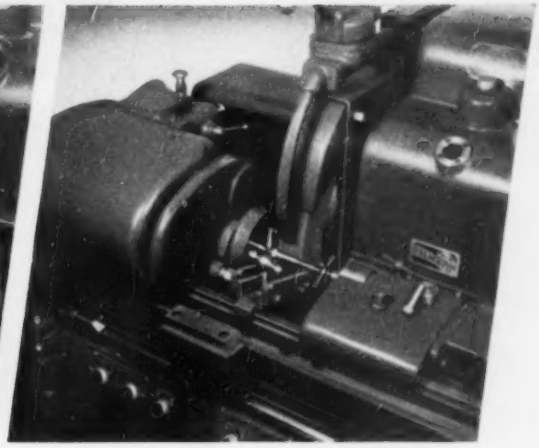


Armature shafts, grinding two diameters in two setups, 200 per hour per diameter. Labor-aiding equipment for the 4" Plain Hydraulic illustrated here consists of automatic infeed, hydraulic footstock, and work cradles.

CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machines are built in 4" x 12", and 4" x 18" sizes. Complete specifications may be obtained by writing for catalog G-551-1.

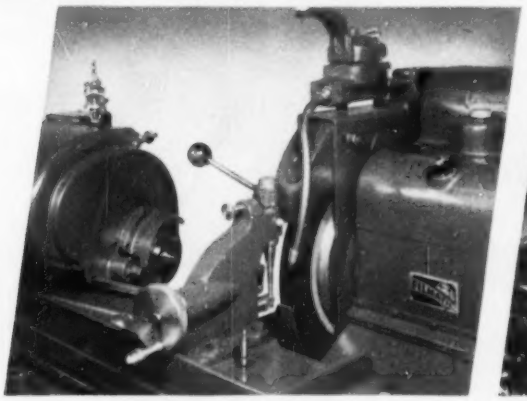
CINCIN

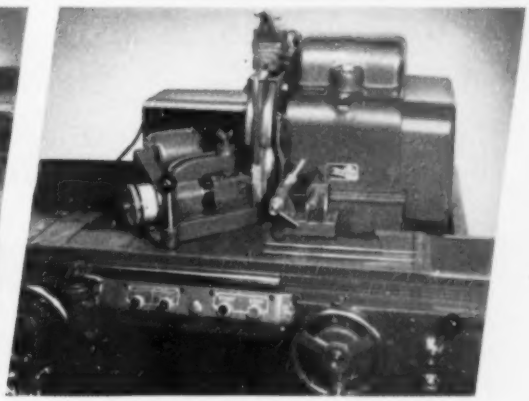


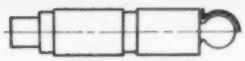


A short, short part . . . grinding the back face and shoulder of nozzles, 83 per hour, with the aid of a special holding device. This 4" Plain Hydraulic Grinder handles other operations, too.

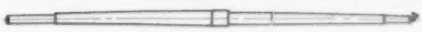
Micrometer barrels, 200 per hour, grinding diameter and bevel simultaneously. This 4" Plain Hydraulic is equipped with work cradles, hydraulic footstock, automatic infeed, and a special table type profile wheel truing attachment.







Radius and adjoining face ground simultaneously. This 4" Plain Hydraulic Grinder features a solid table with a short angular section for the headstock, and a combination radius and angular truing attachment.



Motor driven fixture replaces swivel table, headstock and footstock, for grinding center angle and point radius on textile spindle blades . . . another example of 4" Plain Hydraulic's adaptability to special application.

REPLACE WITH A NEW CINCINNATI

FILMATIC

CINCINNATI

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

It's DOLLARS you'd be *Shaving...*

Consider the seconds saved, the operating ease and tool-life economy of Fellows "Full Tool" Shaving! We'd be glad to tell you where you can see Fellows No. 8 "Full Tool" Shaving Machines doing their daily job of shaving dollars, out of the costs of gear finishing.

You may not have gears of the exact characteristics of the 9.4334/10 normal pitch, 32° helix angle gears below. But your time savings will be in direct relation.

The angular tool application of Fellows "Full Tool" method utilizes higher reciprocating speeds and provides exceptionally free cutting with greater accuracy. Cost wise, there is substantially less tool wear, and much longer tool life between resharpenings. That saves real dollars!

For time and cost estimates, or for descriptive literature, get in touch with the nearest Fellows Office listed below.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
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VAN NORMAN

Reduce Idle Machine Time...

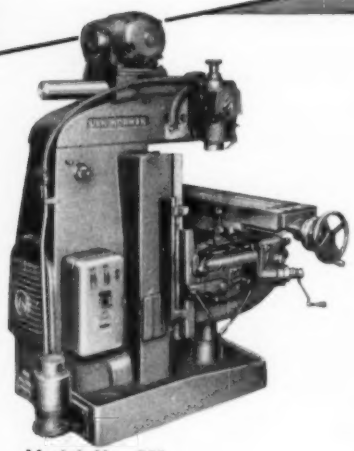
There's A Size To Meet Your Exact Requirements

Manufacturers in all types of industries step up milling production, minimize errors and cut costs per man and machine-hour with Van Norman Ram Type Millers.

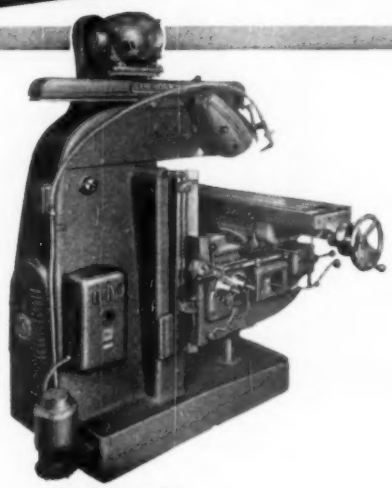
These versatile millers enable you to perform any and every milling job from horizontal to vertical . . . simply by positioning the adjustable cutterhead. This means *one* machine gives you the work range of several types of single purpose millers.

In addition, Van Norman Ram Type Millers save time because most jobs can be carried through to completion without changing the work set-up.

See for yourself how these machines cut costs, improve accuracy and increase production in the tool room, machine shop, laboratory and pattern shop. Their adaptability makes them ideal for maintenance and repair work. They are available in a wide range of sizes . . . for every milling requirement. Write for information.



Model No. 22L
Table size: 45" x 10"

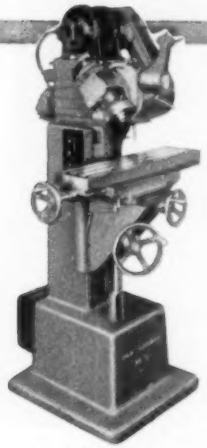


Model No. 26
Table size: 58" x 13"

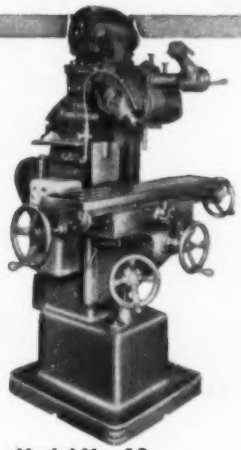
VAN NORMAN COMPANY

Ram Type Millers

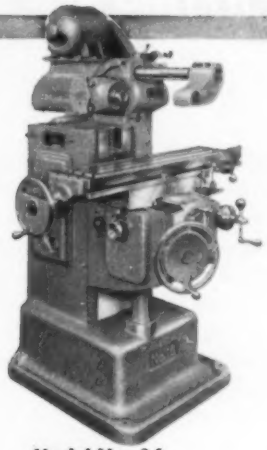
Cut Costs on All Types of Milling



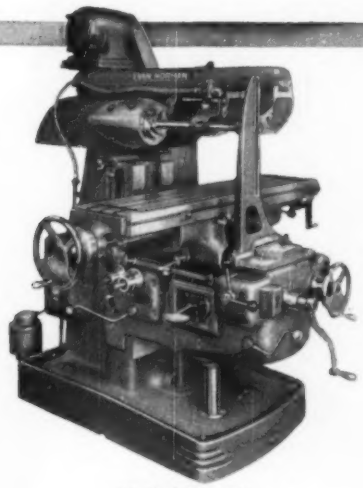
Model No. 6
Table size: 30" x 6⅞"



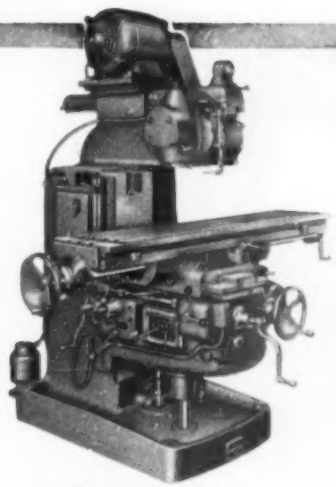
Model No. 12
Table size: 37½" x 9⅜₁₆"



Model No. 16
Table size: 37" x 9½"



Model No. 36
Table size: 64" x 14"

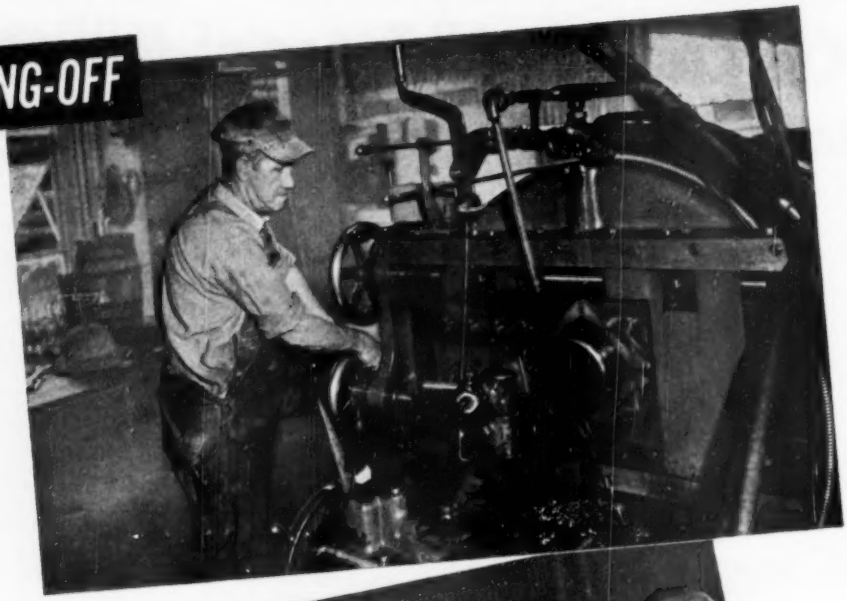


Model No. 38
Table size: 64" x 14"

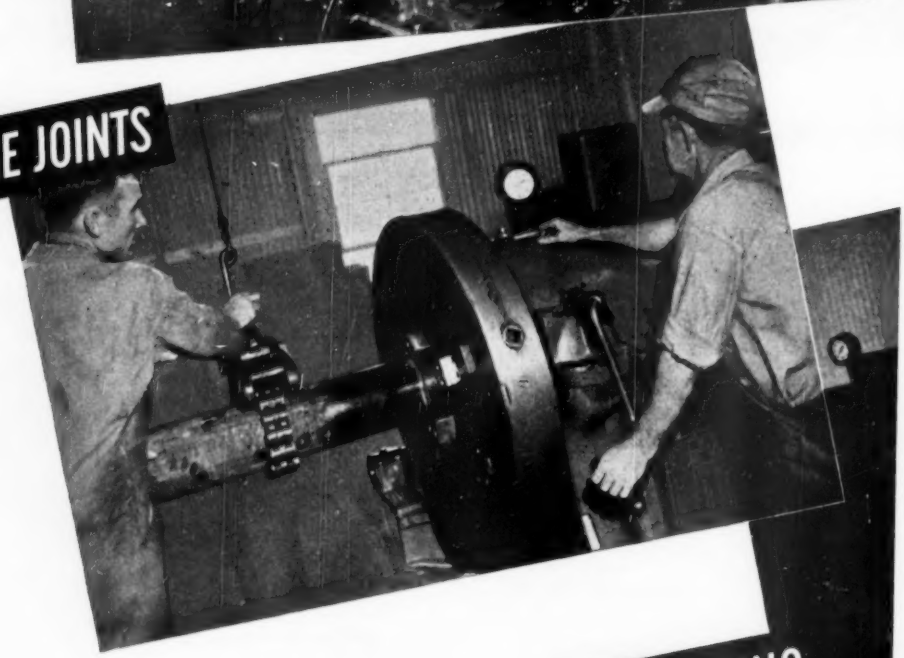
SPRINGFIELD 7, MASSACHUSETTS

MORE JOBS PER

CUTTING-OFF



FLANGE JOINTS



THREADING

DOLLAR INVESTED

PIPE MACHINES DO MANY OPERATIONS FOR THIS TEXAS COMPANY . . .

. . . . . saving handling, saving labor, saving machines . . . resulting in dollars saved and dollars earned for this production plant.

Illustrations show the **same** 13⅜" Landis Receding Chaser Pipe Threading and Cutting Off Machine performing three **different** operations.

CUTTING OFF—Casing is cut off, chamfered and then reamed.

THREADING—7" casing to A.P.I. tolerances, using a cutting speed of 18 surface feet per minute.

FLANGE MAKE-UP—Rear chuck is equipped with grips for making up joints and both the front and rear chucks are used for breaking casing or drill pipe joints in oil field work.

Besides handling a variety of different operations, as shown in this case history, the Landis Pipe Machines offer great versatility in threading operations alone. Each size machine handles a wide range of thread diameters. Within this range, and using the same set of chasers, the machine will cut threads of all diameters having the same taper, pitch and form. In addition, these machines are designed to cut tapered threads to precision tolerances. Accurate taper is assured by the sine bar feature, which causes the chasers to be withdrawn at a rate directly equal to the thread being produced.

Landis Pipe Threading Equipment can widen the gap between costs and selling prices in your plant. For complete details and specifications of Landis Pipe Threading Machines and Landis Tangential Chasers, write for Bulletin #C-77.

Save time ON YOUR GRINDING SETUPS

One machine for all these jobs . . . .

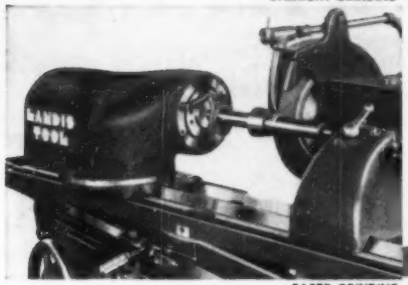
LANDIS TOOL
Precision Grinders

12" Diameter Swing
28" Between Centers
12" Diameter Grinding Wheel
3,250 Pounds Net Weight
51"x105" Floor Space
A.C. Operation

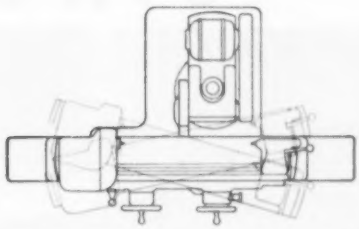
STRAIGHT GRINDING

the NEW LANDIS TOOL *Grindwell*

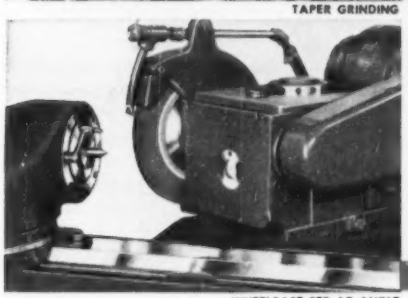
a low cost, general purpose, Universal Grinder



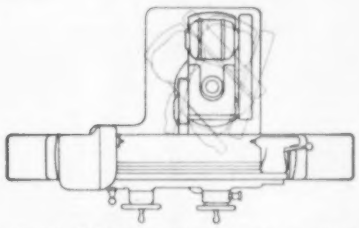
TAPER GRINDING



WORK TABLE SWIVEL—Calibrated scale at end of table for setting angle of taper grinding up to 24° included angle or 5" per foot. Center scale graduated for turning table 90° either direction.

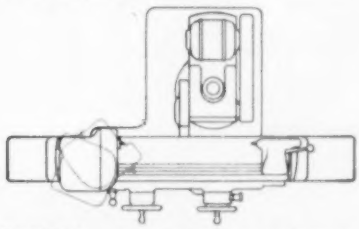


WHEELBASE SET AT ANGLE

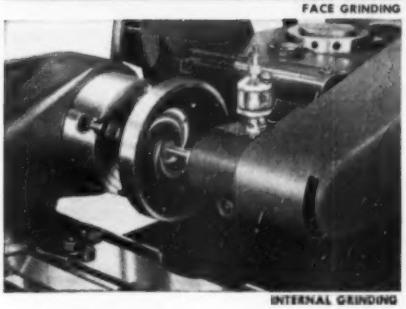


GRINDING WHEEL SWIVEL—Calibrated scale so wheel head can be set for angle up to 90° in either direction to eliminate work piece interference or dress angle on face of wheel.

FACE GRINDING



HEADSTOCK SWIVEL —Calibrated scale so angle up to 90° in either direction can be set for face grinding and tapered external or internal grinding of chucked work pieces.



INTERNAL GRINDING

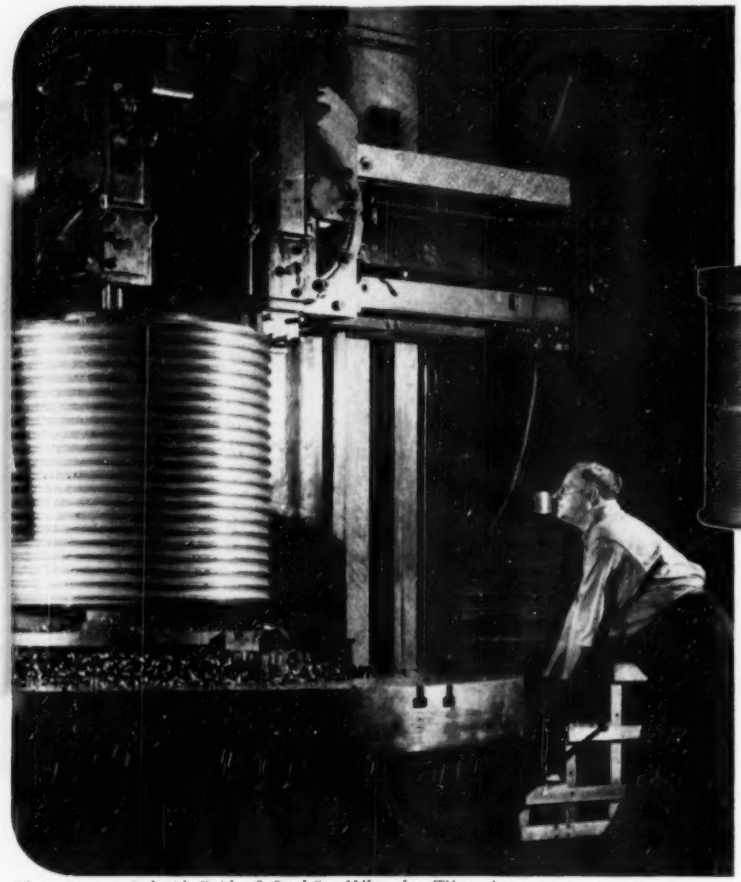
116

For detailed features and specifications, request Bulletin 549, illustrated.

LANDIS TOOL COMPANY
WAYNESBORO, PENNA

where types of work change and operations vary...

CINCINNATI HYPRO



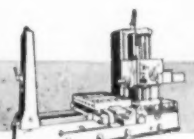
Typical hoist cable drum being scored on a Cincinnati Hypro Vertical Boring and Turning Mill.

Seven-foot cable drum showing right and left hand drum scoring.

Photos Courtesy Lakeside Bridge & Steel Co., Milwaukee, Wisconsin

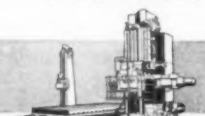
GIDDINGS & LEWIS
FOND DU LAC

G&L HYPRO



G. & L. Table Type Horizontal Boring Machine

G. & L. Floor Type Horizontal Boring Machine



G. & L. Planer Type Horizontal Boring Machine

Vertical Boring and Turning Mills

offer unusual machining versatility and range

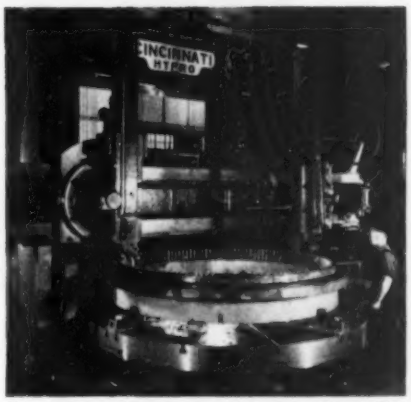
Ample Swing Between Housings and Clearance Under Rail Permits Vertical Mounting of Hoist Cable Drums for Boring, Turning and Drum Scoring

Boring, turning and drum scoring operations on fabricated or cast hoist cable drums are easily handled with a Cincinnati Hypro vertical mill. Drum length and diameter factors that create machining problems on horizontal turning equipment are eliminated by vertical work mounting on the Hypro machine table. Ample swing for large capacity is provided for different diameter drums or any type of cylindrical and odd-shaped workpieces. Clearance under the rail also simplifies machining operations and part setup.

Right and left hand threading and drum scoring after cylindrical surfaces have been turned is accomplished by using a standard thread cutting attachment for this purpose. Quadrant and gears for this attachment is mounted on the machine rail convenient to the operator. In operation the hoist cable drum is placed on the machine table and one end is bored. A precision trunnion pin is mounted in one rail head fitting into this bore to center the workpiece. The second head is then engaged to perform the various operations required.

Competent Engineering Assistance

Experienced Cincinnati Hypro engineers will gladly co-operate with you in determining how your work can be completed faster and better. Recommendations will be made upon receipt of details or prints, if the latter are available. Or, if you prefer, call in a company field engineer and outline your problem.



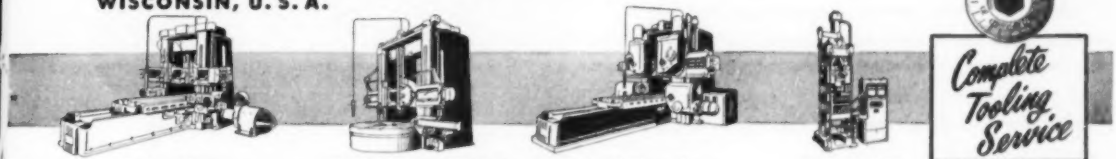
Taper turning a large ring gear for a power shovel. This is a typical job for the Cincinnati Hypro vertical mill.

numerous types of work quickly handled...

The machining versatility and range of the Cincinnati Hypro Vertical Boring and Turning Mill makes it possible to complete many turning, boring, grooving, recessing, facing and similar operations on a broad variety of work. Large, awkward pieces can be mounted on the machine table and rotated. Rail and side heads are quickly and easily adjusted for the different machining operations. This wide work latitude may solve some of your present manufacturing problems.

MACHINE TOOL COMPANY

WISCONSIN, U. S. A.



Cincinnati Hypro Double Housing Planer

Cincinnati Hypro Vertical Boring and Turning Mill

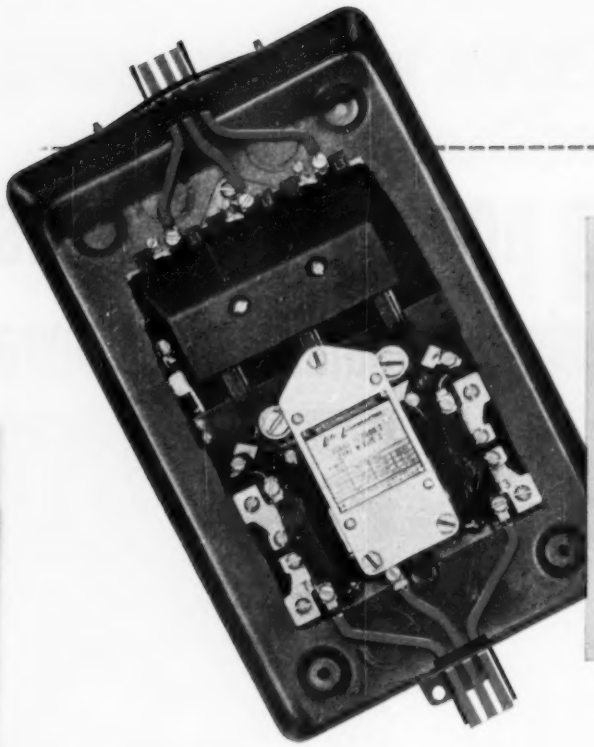
Cincinnati Hypro Planer Type Milling Machine

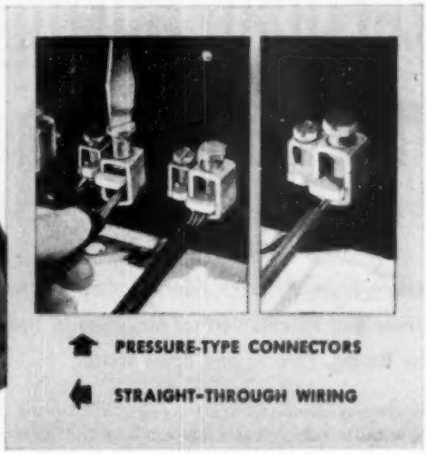
G. & L. Vertical Plastics Injection Press

DAVIS Complete Tooling Service

YOU CAN BE **SURE**.. IF IT'S

Westinghouse





NEW Life-Linestarter*

cuts installation costs 4 ways!

Savings start before they are put in operation . . . with the new Westinghouse Life-Linestarter. New design features permit faster, easier installation—

1. **Straight-through Wiring**—Plainly marked line terminals are *all* at top—load terminals *all* at bottom, permitting simple, straight-through wiring with uniform lead lengths. All terminals are easily reached from the front.
2. **Pressure-type Connectors** speed the job and provide a positive low-resistance connection for either solid or stranded conductor, in a range of sizes to cover all ratings.
3. **NEMA Standard Mounting**—Open starter units conform to the new NEMA mounting dimensions, also to the NEMA sequence of wiring, permitting interchangeability.
4. **Deep-drawn Lift-off Cover**—Exposes unit for easy access. Fastens securely. May be padlocked. No hinge trouble.

The Life-Linestarter cuts costs in other ways, too—uniformity and completeness of line (NEMA sizes 0 through 4, to 100 hp, 600 volts) . . . superior performance . . . positive protection. Ask your Westinghouse representative to show you "the inside story"—a Trans-Vision presentation. Or write for booklet B-4677. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-30025

*Trade Mark

Westinghouse

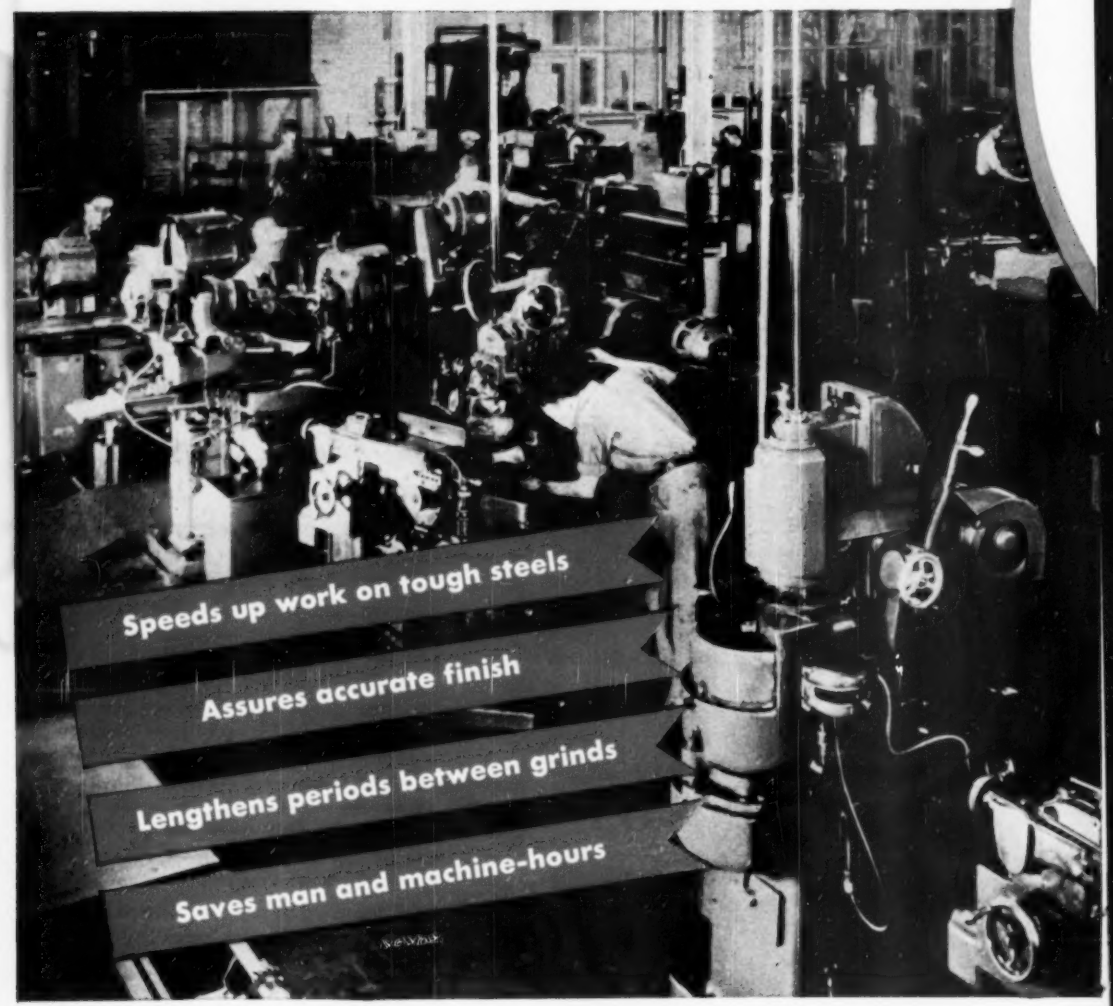
Life-Linestarter

TOMORROW'S STARTER—TODAY!

When considering your machine tool requirements for 1951— remember, Warner & Swasey sells one thing . . .

INCREASED PRODUCTION

FOR THOSE DIFFICULT ...USE



JOBS AUTOKUT!

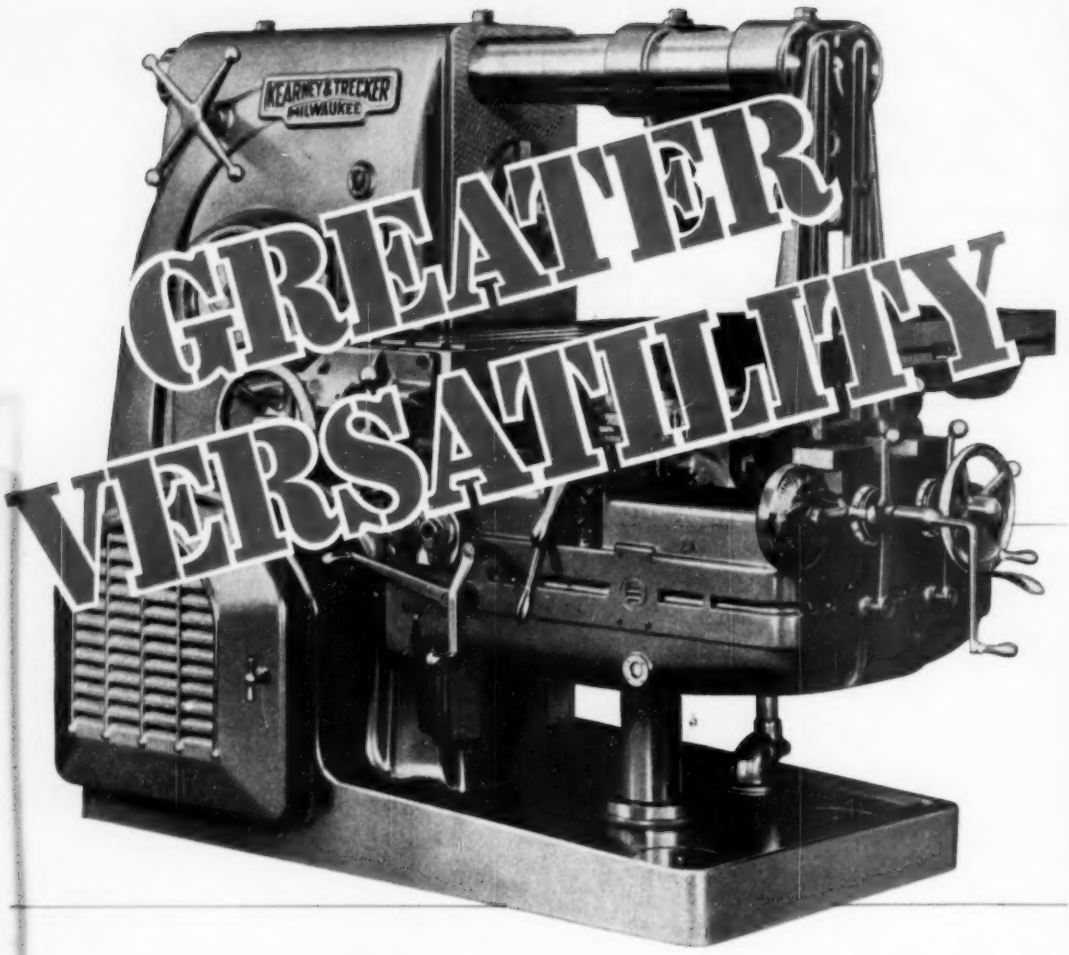
Wherever cutting oils are used, even for such severe jobs as broaching, threading or tapping tough alloys—whether you want speed, perfection of finish, or stock removal—Sinclair AUTOKUT Oils are the answer.

Specially compounded, heavy-duty, hard-working AUTOKUT Oils prevent welding at the tool point and preserve the cutting edge, lengthening periods between grinds.

Save man-hours . . . machine hours . . . and reduce rejects—Use Sinclair AUTOKUT on the tough ones!

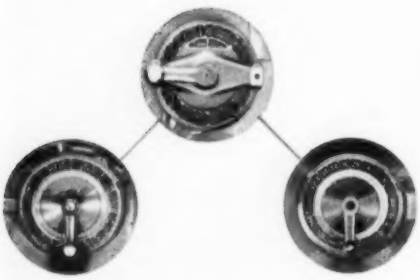
SINCLAIR INDUSTRIAL OILS

For lubrication counsel, see your nearest Supplier of Sinclair products or write Sinclair Refining Company, 630 Fifth Avenue, New York 20, N. Y.

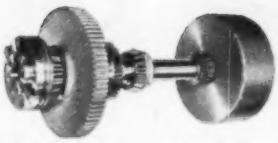


GREATER VERSATILITY

A new line of Knee-Type Milling Machines KEARNEY & TRECKER MILWAUKEE **CK's**



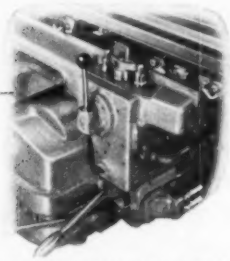
Kearney & Trecker's new CK milling machines are designed for the most effective use of modern cutting tools. Their wide ranges of speeds and feeds are closely suited to nearly all general purpose milling applications on most kinds of ferrous and non-ferrous metals and their alloys. On all CK machines you can select from 24 spindle speeds ranging from 15 to 1500 rpm on No. 2 and 3 size machines — and 13 to 1300 rpm on No. 4, 5 and 6 sizes. For quiet, effortless speed changing there's Kearney & Trecker's new automatic Protecto-mesh shift which eliminates gear clashing. All CK machines are equipped with the extra-wide feed range, ¾" to 90" per minute, with separate motor drive for all feed and rapid traverse movements.



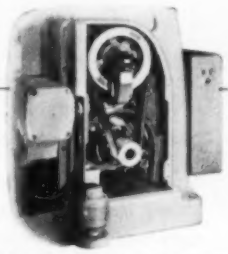
GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney-& Trecker's original 3-bearing design.

GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

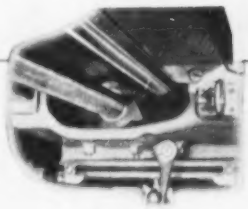
NON-GLARE RAPID-SET DIALS—You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a satin surface with high contrast markings. They're easy and quick to set and provide positive lock at every setting.



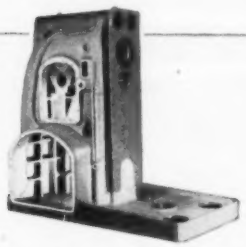
GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE—Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time on both long and short run lots. Operators will like it because it makes faster, simpler, less fatiguing work for them.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.



GREATER RIGIDITY — Yes, these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more metal scientifically distributed in heavier ribbing, box section, sponson construction . . . to effectively absorb vibration from heaviest cutting loads.

Kearney & Trecker's new CK Line is designed to meet every demand of present-day milling operations . . . making CK machines more accurate, and MORE PRODUCTIVE for you. Contact your nearest Kearney & Trecker representative or write direct to obtain complete specifications of these fine new machines. See how they easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 West National Avenue, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

Replacement of obsolete machine tools is an investment that makes Dollars and Sense.

Look twice at

Yes! Look at the BROACHING MACHINES

and look at the TIP-DOWN FIXTURES

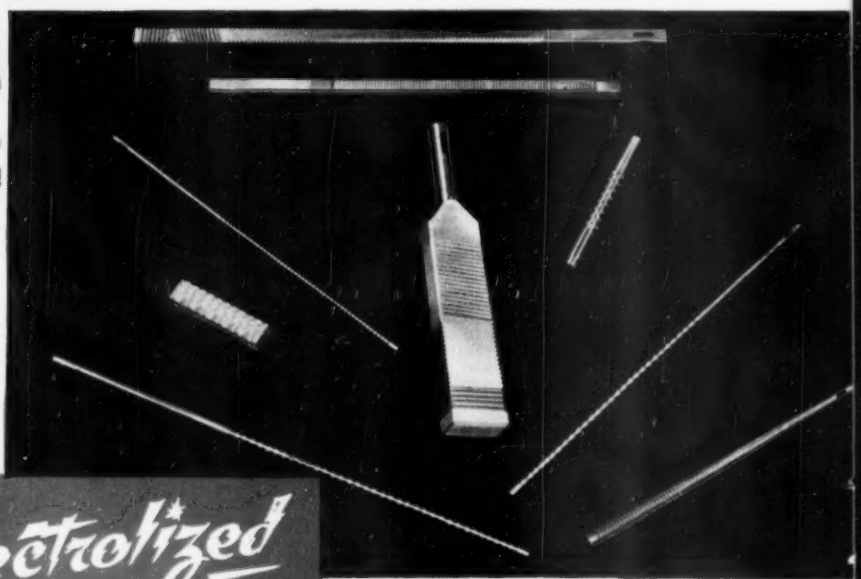
LAPOINTE Broaching Machines and Tip-Down Fixtures warrant a second look — that is, if you want to increase your production, improve your quality, and drive down your costs . . . and do all this with *less operator fatigue and down-time!*

The pictures tell the story. TIP-DOWN FIXTURES shown here, are a Lapointe patent. They provide exceptionally easy loading and unloading by bringing the work-holder out front *where the operator can see it and get at it.* TIP-DOWN FIXTURES do not sacrifice any of the stroke available on the machine, they permit the use of a great variety of work-holders that can be manually or (automatically) hydraulically clamped, they are extremely *fast.*

LAPOINTE

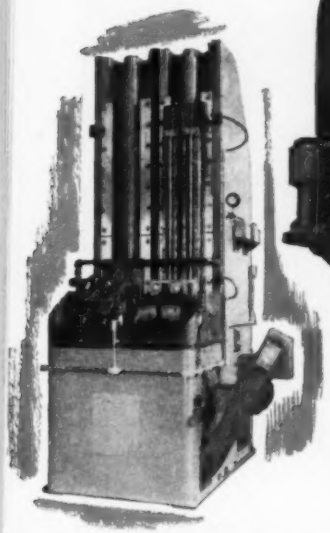
Broaching Tools are worth looking at, too!

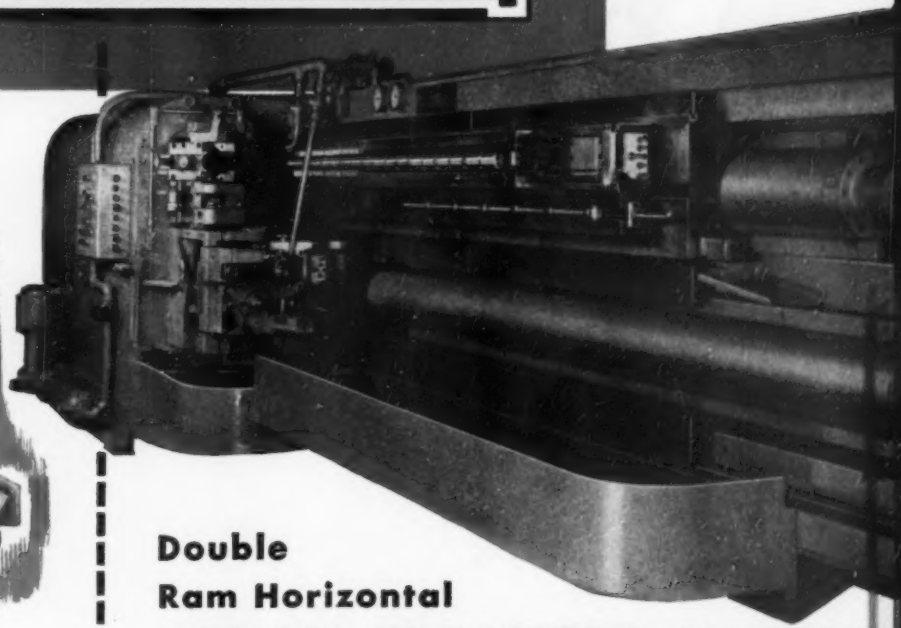
Ground from special steel meeting our formula requirements, they are said to be the finest broaches that present-day engineering skill can produce. On order, our broaches can be Electrolized to double their life between grinds. (Sometimes it's multiplied by 10!)



Electrolized BROACHES . . . exclusive with LAPOINTE

LAPOINTE





Double Ram Vertical SURFACE BROACHING MACHINE

Available in ten standard sizes from 3-ton to 25-ton, and 30-inch to 66-inch strokes, our double ram vertical Surface Broaching Machines offer maximum production advantages when equipped with TIP-DOWN Fixtures. Impressive structural stability is achieved through the design of the massive frame. Low pressure system assures smooth, trouble-free operation. Note the *automatic chip conveyor* which allows continuous operation.

Built to JIC standards at no extra cost.

Double Ram Horizontal SURFACE BROACHING MACHINE

Where headroom is limited, this horizontal type double ram Surface Broaching Machine will take care of many tough broaching jobs — such as automobile cylinders, connecting rods, and other high production parts. It is built in 15- and 25-ton sizes, with 66-inch, 90-inch, and 120-inch strokes. Rigid, rugged, versatile . . . *and easy to load!* (See those TIP-DOWN Fixtures?)

LAPOINTE has the most economical answer to any broaching problem. And remember: Lapointe can take full responsibility, in both engineering and building the complete job . . . machines, fixtures, and tooling.

Send for "Condensed Catalog No. 2," showing all our machines.

THE *Lapointe* MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory • Edgware • Middlesex • England

HUDSON LAPOINTE MASS.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

Announcing:

PRATT & WHITNEY

Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

NATIONAL SALES AGENTS FOR

Steinle Centerless

THREAD GENERATORS

The addition of this well-known line adheres to the strict Pratt & Whitney policy of offering only the finest of precision tools that measure up to P&W standards in workmanship, performance and output.

Steinle Centerless Thread Rolling Machines are now available through Pratt & Whitney Branch Offices for rolling a wide range of strong, accurate and perfectly finished threads with outstanding economies in production. Machines range in capacity from No. 8 screw to 4" diameter, and roll repetitively to an accuracy of .0002" with a surface finish of 3 micro inches.

Pratt & Whitney Branch Offices: **Birmingham • Boston • Chicago Cincinnati • Cleveland • Detroit • Los Angeles • New York Philadelphia • Pittsburgh • Rochester • San Francisco • St. Louis**

For best results in quality of threads, long roll life, and resultant economy — always specify the perfect team-mates for Steinle Machines — *PRATT & WHITNEY large diameter (4 to 5 inches) alloy steel Circular Thread Rolling Dies.* Prompt delivery can be made on all standard pitches. Send print of part, with complete thread specifications for quotation.

THE *Steinle* MACHINE COMPANY

NEW BRITAIN, CONNECTICUT

makes CRAFTSMEN - THIS NEW

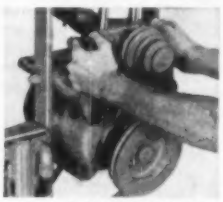
PRATT & WHITNEY *"Series M"*

KELLERFLEX

Much more versatile, this new "Series M" KELLERFLEX gives you 16 constant shaft speeds, provides the "mechanical muscle" and the power to do a smoother, better job of burring with high speed steel and carbide DI-BURS...and filing, sanding, grinding, wire brushing and polishing. Use it anywhere in the shop — it *makes* craftsmen. With it, you'll do more work, with greater convenience, at a cost lower than ever before.

ONE MODEL FITS ALL NEEDS

Kellerflex comes to you as a standard floor model. Disassemble roller stand, and it's a bench model. Lift it by cable, and it's a balanced suspension model. No whip, no cramping, no matter how you use it.



16 CONSTANT SHAFT SPEEDS

Simply loosening 2 hand clamps and a simple adjustment puts the correct rpm at your finger tips. Range of 1000 to 6000 with 1725 rpm motor; 2000 to 12,000 with 3450 rpm motor.

Your nearest P&W Branch Office will gladly provide a demonstration. Or write for this new P&W Kellerflex Bulletin to bring you up to date on the finest in modern flexible shaft equipment.

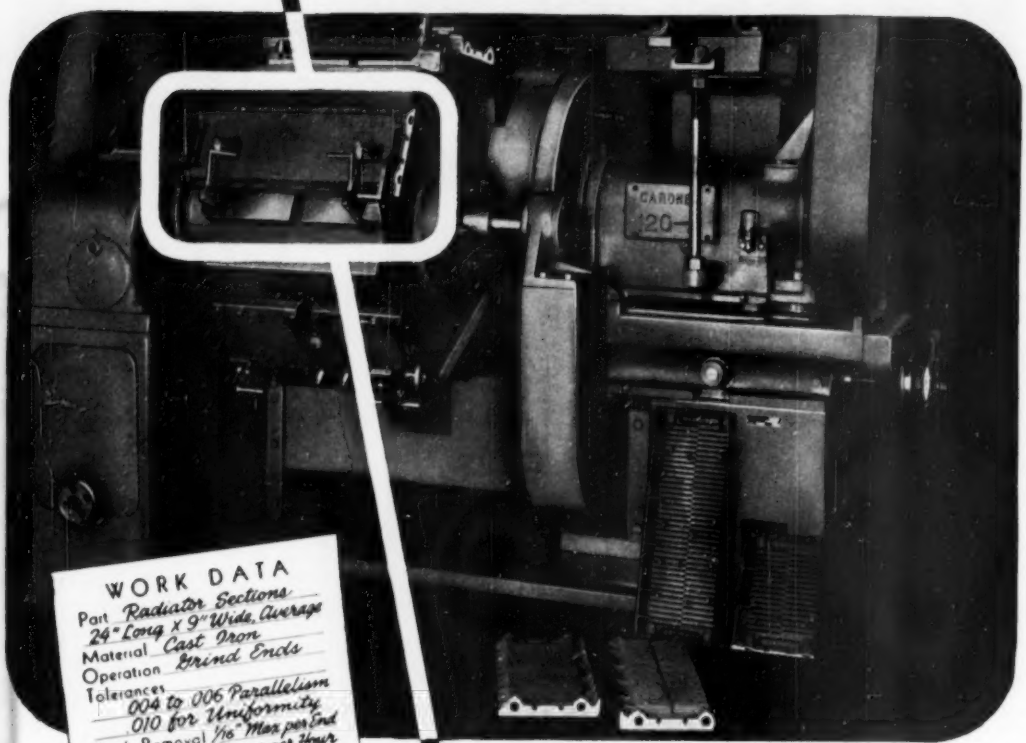
PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

Branch Offices: Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas (The Stowe Co.) • Detroit • Houston (The Stowe Co.) • Los Angeles • New York • Philadelphia • Pittsburgh • Rochester • St. Louis • San Francisco

Double GARDNER-GRINDING



WORK DATA

Part *Radiator Sections 24" Long x 9" Wide, Average*
Material *Cast Iron*
Operation *Grind Ends*
Tolerances *.004 to .006 Parallelism .010 for Uniformity*
Stock Removal *1/16" Max per End*
Production *180 Pieces per Hour*
Feeds *Hand-Load and Unload; Unclamping Performed Automatically*
Machine *No. 120A-30" Gardner Grinder*

big machine . . . big parts . . . big production!

Parallel-surface grinding both ends of these radiator sections presents no problem for this big No. 120A-30" Gardner Double Grinder. Big production of big parts reduces costs, saves time, increases volume.

Gardner Double Grinders will handle almost any size part, almost any type of material. Let us help you to achieve big production . . . the GARDNER way!

Ask for our DOUBLE-GRINDING Bulletin!

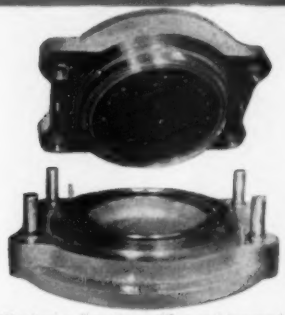
GARDNER MACHINE COMPANY

410 EAST GARDNER STREET . . . . BELOIT, WISCONSIN, U.S.A.

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



A-H5 solved a distortion problem and increased the production of large dies for blanking tank heads.

A-H5 Cures Distortion of Large Blanking Dies

A manufacturer of water-heaters couldn't seem to prevent an excessive amount of distortion in large-diameter forged rings of oil-hardening steel for blanking out heads for water tanks. Our distributor recommended A-H5 (5 pct chrome, air-hardening) tool steel because of its greater resistance to distortion . . . and its added features of high wear-resistance and toughness.

After A-H5 had been used for one year, the records showed that besides licking the distortion problem, the air-hardening grade had made possible a nice increase in production . . . and the cost of the tool steel was no greater than before.

A-H5 is an economical, general-purpose grade—especially for tools and dies that call for long wear, high resistance to distortion, and for extra safety in hardening.

Our Tool Steel Engineer Says:

There are good reasons for annealing tool steel

Most tool steel bars are furnished in the annealed condition. The annealing is done for two reasons:

1. To remove the stresses in the as-rolled or as-forged bars which could otherwise lead to cracking.
2. To produce the lowest possible hardness consistent with the best machinability.

During the annealing operation, care must be used to avoid excessive scaling and decarburization. The bell-type, controlled-atmosphere furnaces used in our tool-steel mill are ideal for this purpose. We can far surpass the results obtained with ordinary annealing equipment.

TOOLS MADE OF 67 CHISEL WITHSTAND BRUTAL SHOCK

67 Chisel, used in this punch, absorbs plenty of shock in the forming of parts from 0.185-in. sheet steel.

This die, used for "dimpling" aluminum aircraft skin, is made of 67 Chisel and is heated electrically to 600 F so as to stress-relieve the aluminum during the operation.

Made of 67 Chisel, this intricate master hob is used to hob a mold cavity for die-casting a multiple gear.

As its name implies, 67 Chisel is primarily for shock tools . . . but chisels account for only a small proportion of its many applications. This chrome-tungsten steel has high shock-resistance, good red-hardness, and it is readily carburized for high wear-resistance.

67 Chisel is first choice for master hobs used in hobbing molds for plastics and die-casting work. It's often used for punches, swaging dies, calking and beading tools . . . heavy shear blades for cold work and for hot work up to 1000 F . . . and various shock and hot-work jobs such as studs and bolts for elevated temperatures, drop-forge die inserts, piercers, headers, and forming tools.

Carburizing produces a high surface-hardness that's reinforced by a tough, shock-resisting core. 67 Chisel has very high impact properties—about 175 ft-lb. That's really tough!

67 Chisel is a mighty versatile grade to keep in mind when you need tools that will stand up under heavy shock or high pressures; and it's especially recommended for tools having deep recesses, corners, slender shanks—wherever great strength is needed. You'll find it's an easy steel to machine and heat-treat.

67 Chisel is stocked in many sizes and sections in our mill depot . . . also by distributors of Bethlehem Tool Steels in principal cities.

Choose Tool Steel To Fit the Job

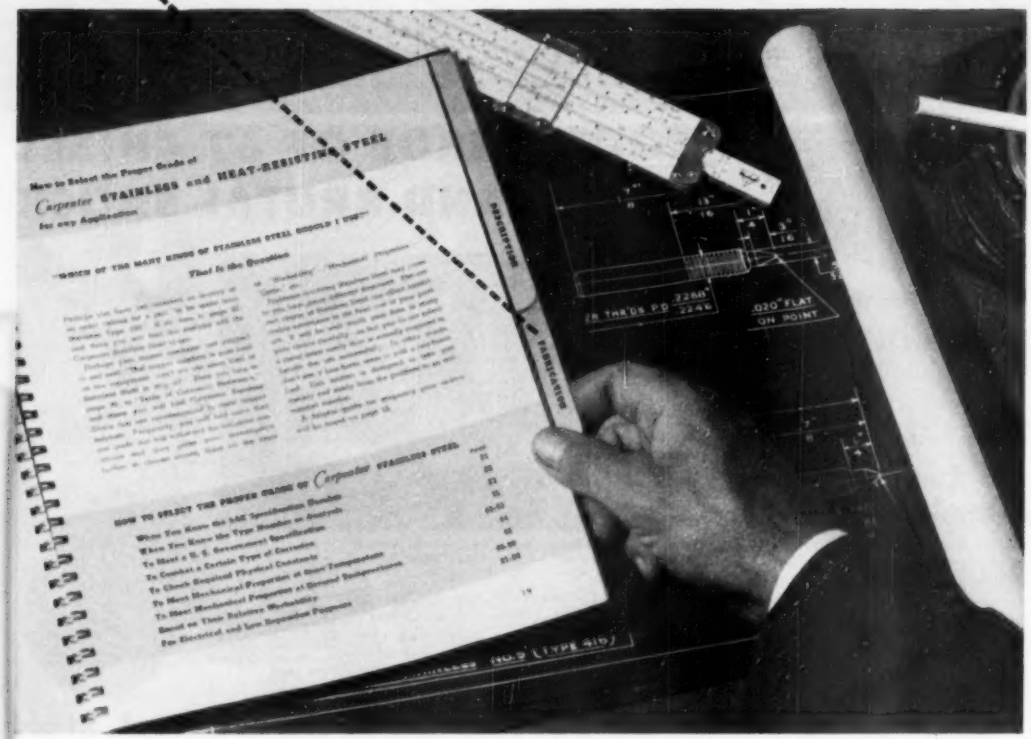
Shop men sometimes have deep-rooted ideas about tool steel that just aren't based on facts. The other day, for example, we saw a milling cutter made for a rather unusual machining job. The toolmaker had selected high-speed steel, figuring it would last longest because it was the most expensive and the most highly alloyed grade.

He made a poor choice, for the high-speed cutter produced only 18 pieces before it failed. One of our tool-steel engineers was called on to explain this disappointing performance. He recommended Bethlehem XX Carbon Tool Steel . . . and the first cutter made from it finished 175 pieces.

It's just another instance of the longer tool life made possible by selecting the right grade of tool steel for the job. Our technical staff is always ready to assist in selecting tool steels and in recommending the best methods of heat-treating.

Bethlehem ULTRASONIC TESTED **Tool Steel**

X MARKS THE SPOT


How to Select the Proper Grade of
Carpenter STAINLESS and HEAT-RESISTING STEEL
for any Application
"WHICH OF THE MANY KINDS OF STAINLESS STEEL SHOULD I USE?"
That Is the Question
DESCRIPTION
FABRICATION
HOW TO SELECT THE PROPER GRADE OF Carpenter STAINLESS STEEL
When You Know the SAE Specification Number
When You Know the Type Number or Analysis
When You Know the U. S. Government Specification
To Resist a Certain Type of Corrosion
To Combat a Certain Type of Corrosion
To Check Required Physical Contents
To Check Required Physical Properties at Room Temperature
To Meet Mechanical Properties at Elevated Temperatures
To Meet Mechanical Properties at Elevated Temperatures
To Meet Mechanical Properties at Elevated Temperatures

Yesterday
76
MINUTES

Today
34
MINUTES

"AMERICAN"
HYDRAULIC DUPLICATOR

The Latest COST CUTTING Sensation

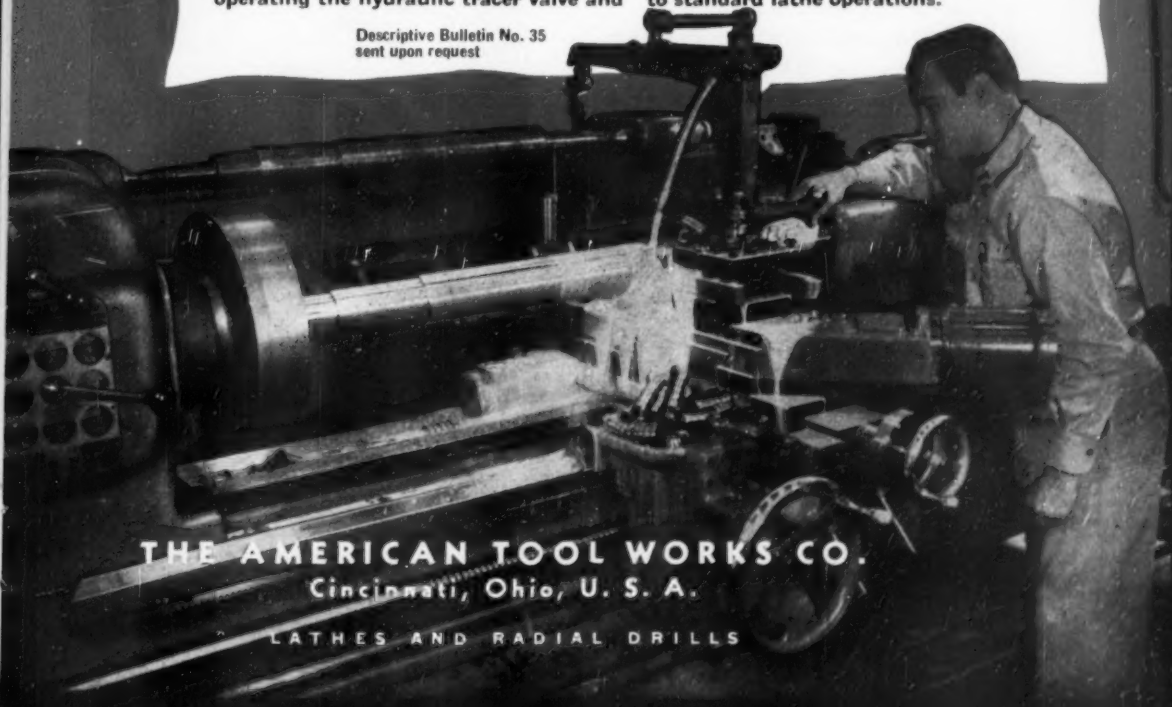
Here's a job that's being done in 34 minutes, floor to floor. This includes a finishing cut to reduce grinding time to a minimum. It formerly took 76 minutes to turn and 50% longer to grind.

This marvelous machine will reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii and is especially adapted to the production of such work as spindles, motor shafts, valve stems, back shafts, piston rods and axles. It will also accommodate a wide variety of chuck work having irregular contours.

A single hydraulic system is employed for operating the hydraulic tracer valve and the piston which controls the movement of the tool slide carrying the cutting tool. This simplicity is an outstanding feature and insures accurate reproduction, freedom from failures and elimination of work rejects. This new metal cutting technique permits continuous cutting without interruption for measuring or calipering at feeds and speeds to the cutting limit of Cemented Carbide tools. "Miking" on shaft work is confined to the first diameter only after which all other diameters are secured automatically.

This machine may be quickly converted to standard lathe operations.

Descriptive Bulletin No. 35
sent upon request



THE AMERICAN TOOL WORKS CO.
Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Want to cut costs on screw

Production Increased 27%

Grade: MX
Size: 1 3/8" Round
Part Name: Main gear polisher, movie projector
Machine: 1 1/2" Single Spindle Brown & Sharpe, G-2
Operations: Drill, thread, broach, rough form, finished form, cut-off
Cutting Media: Socony Vacuum All-Purpose. (3 to 4% sulfur added)

Comparative Production:

Grade	SFM	Seconds per part	Hourly Output Rate	Daily Output Rate*
B-1113		35	103	576
MX	312	27.5	131	736

*Based on 70% efficiency

Finish reported excellent and part tolerances very close. (Material furnished cold-drawn by Bliss & Laughlin, Inc.)

Production Increased 14% Longer Tool Life

Grade: MX
Size: .650" Round
Part Name: Lift Pin for Automobile Window
Machine: RA-6 Acme-Gridley
Operations: Breakdown, rough form, shave, drill, cut-off
Coolant: Paraffin oil

Comparative Production:

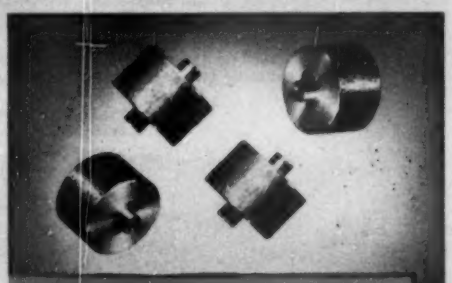
Grade	SFM	Seconds per part	Hourly Output Rate
B-1113	200	4	900
MX	220	3.5	1038

(Material cold-drawn by Pilgrim Drawn Steel Division, Automotive Materials Corp.)

Here, laboratory tests accurately forecast MX performance

In developing U-S-S Free-Machining MX Screw Stock, extensive use was made of the Constant Pressure lathe test by which the machinability of different test heats of steel can be accurately compared. Using samples from numerous production heats of both B-1113 and MX, it was shown that MX has an average index rating 35% higher than the average for B-1113 Steel—some individual heats of MX have rated over 60% higher.

Production runs have confirmed these findings. In the fabrication of a variety of parts in many screw machine departments, results have shown very close correlation with the results obtained in the laboratory.



Production Increased 66% Tool Life Increased 87%

Grade: MX
Size: 3/8" Round
Part Name: Roller

Comparative Production:

Grade	SFM	Seconds per part	Hourly Output Rate	Tool Life (Hrs.)	Tool Life (Parts*)	Tool Life Increase
B-1113	195	10	360	4	1008	
MX	260	6	600	7.5	3150	87%

*Based on 70% efficiency

Operator reports MX does not break off before cut-off is completed.

(Material furnished cold-drawn by Wyckoff Steel Co.)

machine parts?

Do the job *faster* with MX

the new free-machining Bessemer screw stock!

WITH U·S·S Free-Machining MX Bar Stock you can cut the cost of *any* part you now machine from ordinary Bessemer screw stock — whether machine work is much or little.

What is more, the higher the conversion cost in comparison to the material cost—or in other words, the more machine work the part requires—the greater your savings will be.

These are facts, well established by the amazing results that screw machine operators everywhere are obtaining with MX. They report that, even though MX costs slightly more than standard B-1113 stock, *parts made with MX cost less per unit.* Machine test reports show that their costs have dropped anywhere from 6% to as much as 22%.

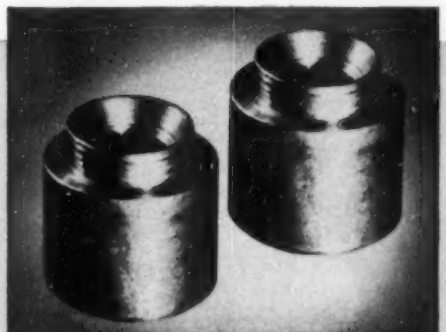
For example, here are the estimated savings on typical screw machine parts such as you are running every day. On 10,000 spindle sleeves, MX at an added cost of $2.36 reduced total cost $73.14; on 10,000 ¼" shafts, 70 cents extra for MX saved $21.71; for only 37 cents more for MX the cost of 10,000 screws dropped $52.90.* (How much longer can you afford not to use MX?)

If you want to prove for yourself how the superior cutting properties of MX will increase your output and reduce your costs, give this free-machining Bessemer screw stock a thorough trial on your own equipment. We believe that the results will convince you that free-machining MX is the most efficient and the most *economical* bar stock you have ever used.

MX is being produced in all the popular bar sections and sizes. You can obtain it in cold finished form from your regular supplier as "MX," or under his own identifying trade name. In hot rolled bars, MX is available direct through our nearest district sales office.

For more parts and better parts—at lower cost per part —standardize on MX.

**These cost figures have been calculated on the basis of assumed rates for direct labor and machine overhead and machine efficiency.*



Production Increased 51%

Grade:	MX
Size:	1⅛" Round
Part Name:	Pulley Hub
Machine.	6-Spindle Conomatic 1¼"
Operations:	Rough form, finish form, drill, ream, countersink, spin, cut-off

Comparative Production:

Grade	Seconds per part	Hourly Output Rate
B-1113	33	197
MX	15	238

The improved deforming qualities of MX were used to advantage here in cold-crimping pulleys to hubs.
(Material furnished by LaSalle Steel Co.)

USS

AMERICAN STEEL & WIRE COMPANY, CLEVELAND
CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carnegie-Illinois Steel Corporation
Room 4214 Carnegie Bldg., Pittsburgh 30, Pa.

Please send me a copy of the MX Bulletin.

Name.....

Address.....

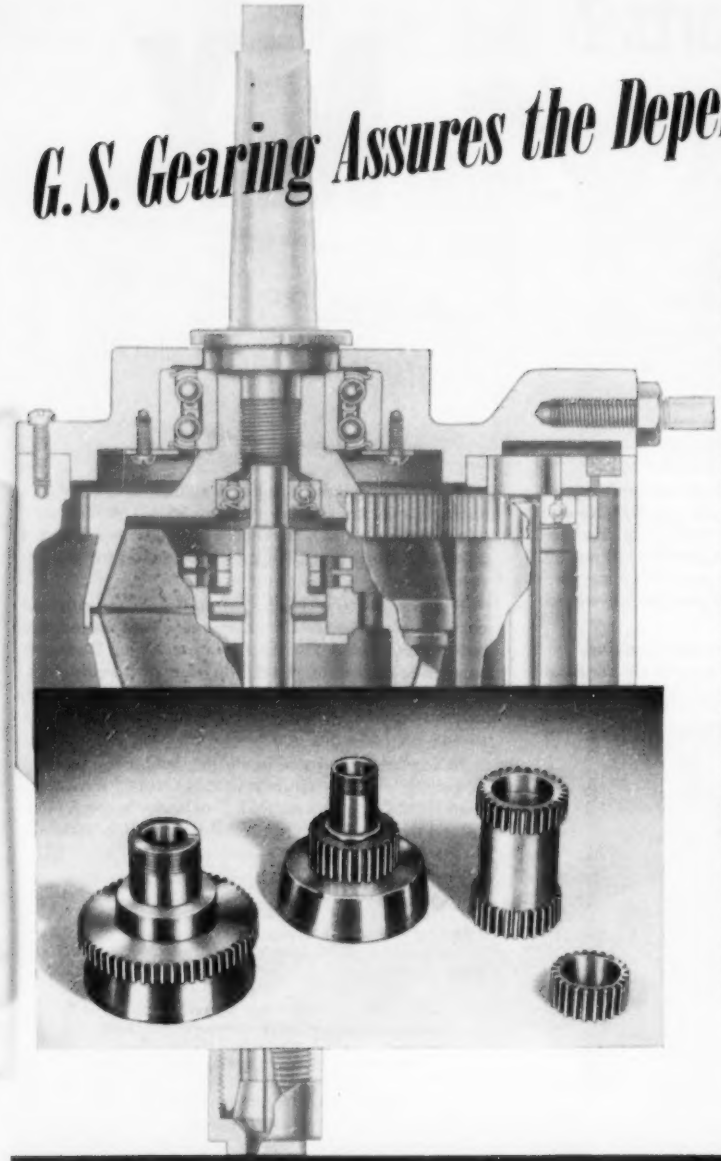
Company.....

City.....Zone....State.....

UNITED STATES STEEL

G.S. Gearing Assures the Dependability of Snow

TAPPING, DRILLING AND THREADING EQUIPMENT



SNOW MANUFACTURING COMPANY has long enjoyed an enviable reputation for leadership in the field of Automatic Drilling, Tapping and Threading Machines. The absolute *dependability* and long life of their equipment is largely due to the consistent use of finest materials and the extreme precision with which all parts are made.

Invariably Snow specifies G.S. Fractional Horsepower Gearing for their driving mechanisms. They, like so many other leading manufacturers from coast-to-coast, have found that G.S. Gearing assures a degree of *uniform* high quality and trouble-free operation which *only these better Gears can give!*

If you have a Fractional Horsepower Gearing problem, however simple or intricate it may be, submit it to our capable staff. Get the advantage of our unusual "know-how" gained thru more than 30 years' *intensive specialization* in the design and quantity production of Gearing ranging from 12 to 96 D.P. and finer. Ideas, suggestions and moderate cost estimates won't cost you one penny. Will you write for them today?

Send for Free . .

new 6-page folder which illustrates and describes G.S. facilities. Small Gearing and applications together with handy charts for those who specify Gearing from 12 to 96 D.P. and finer. Will you ask for it on company stationery, please?

FRACTIONAL HORSEPOWER GEARING

GS

GEAR Specialties, Inc.

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

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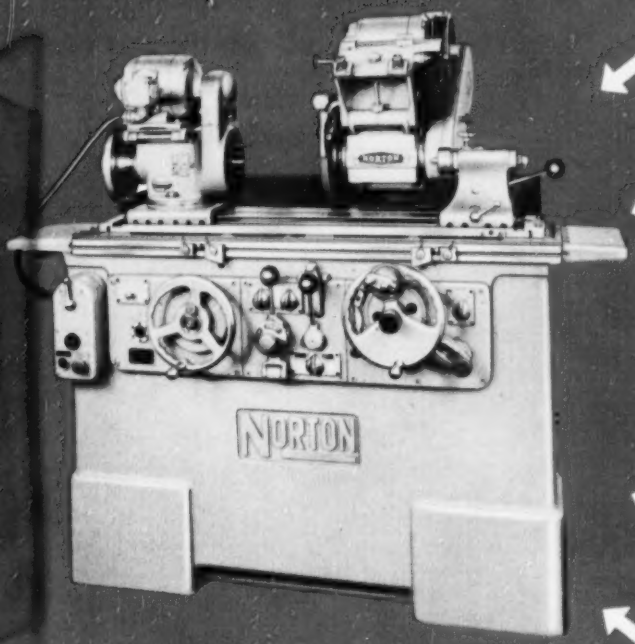
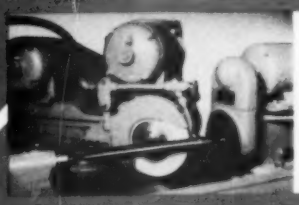
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

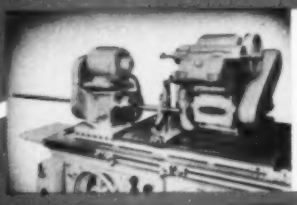
Versatility PLUS Economy
Operating
...result from 7 design features built into the Norton 10x20" Universal
NORTON
GRINDERS and LAPPERS

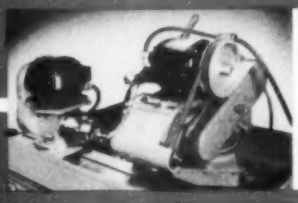
7 Important Features

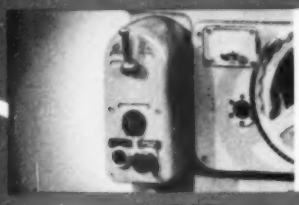
of the Norton 10 x 20" Universal Grinder

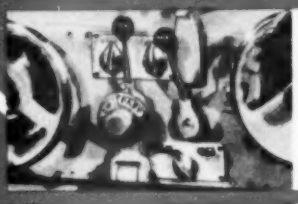












...To Economize-
MODERNIZE with
a New NORTON...

INTERCHANGEABLE HEAD and FOOTSTOCK greatly simplify set-up problems, and changeover permits easy grinding of shoulders or spacers.

CAM LOCK NOSE on this end of headstock spindle permits attachment of conventional or speed chucks in a matter of seconds.

HOLLOW SPINDLE in HEADSTOCK will permit work up to 1" in diameter (and which is longer than machine) to be passed clear through.

COMPOUND WHEEL SLIDE design permits swivelling of wheel head to any angle and wheel feed at any angle.

START, STOP, and WORK JOG CONTROL positioned for maximum convenience as are start and stop buttons and speed control dial.

PRESET TRUING SPEED CONTROL enables table speed settings to remain undisturbed during truing. Independent right and left-hand dwell controls.

HINGED TYPE WATER GUARD extending full length of swivel table prevents objectionable spatter of coolant.

This Many-purpose Machine Brings Flexibility And Economy To Tool Room and Production Work

Its head and footstock are symmetrical and their positions may be quickly *interchanged*. The headstock may be used at its normal position or at the right end of the swivel table, where an electrical plug-in socket is provided. Likewise, the footstock may be used at either the left-hand or the right-hand end of the swivel table. For some jobs, this changeover to permit grinding of shoulders or spacers is preferable to the alternative method of achieving the same results by shifting the grinding wheel from the left to the right end of the spindle.

The headstock spindle has a conventional dog drive plate on one end and a D-1 3" nose standard lathe spindle (cam lock) on the other. This cam lock nose accommodates many types of jaw and speed chucks, thereby simplifying set-up where much chucking of the workpiece is required.

The headstock spindle will accommodate a bar 1" in diameter *clear through*. Therefore, a workpiece longer than the machine may be ground by chucking at one end and allowing the rest of the piece to pass through the headstock.

The external grinding wheel spindle provides maximum flexibility in set-up since the grinding wheel may be mounted on either the right-hand or the left-hand end.

The internal grinding spindle, driven by a separate 1 h.p. motor, is a quickly positioned, hinged bracket type. This makes it possible to swing the internal spindle up out of the way when doing external grinding, or to quickly position it when internal grinding must be done. It also enables the operator to grind the outside diameter and the inside diameter of a workpiece without disturbing the set-up. Also, the internal grinding spindle is designed for quick removal should an unusual problem of clearance arise. Removal is quickly accomplished by withdrawing the hinge pin.

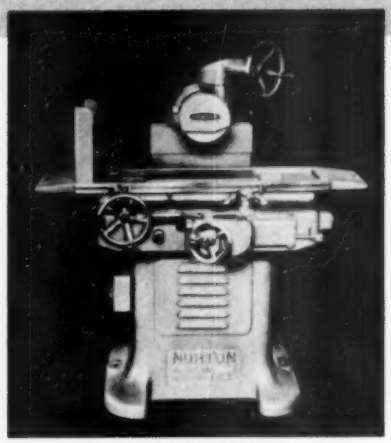
The compound swivel arrangement of the wheel slide enables the operator to set the wheel at any angle and to feed at any angle. Accuracy in the wheel feed is assured by the use of a generously proportioned feed screw and half-nut, which in effect is a large micrometer. This assures a fine degree of precision during the life of the Norton Universal Grinder.

These features of the Norton 10 x 20" Universal Grinder and many other important details are illustrated and described in our Catalog No. 170. Write for your free copy today.

Four Other New NORTON COST-CUTTERS

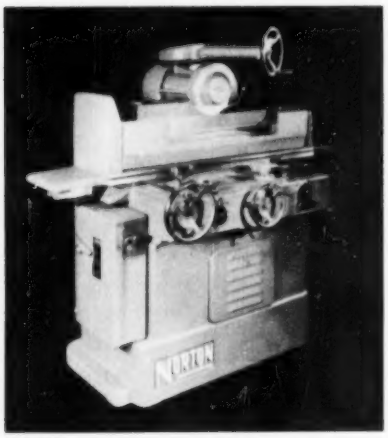
The No. 20 Cutter and Tool Grinder

The highly versatile, ***tilting wheel head*** machine for general tool room service. Catalog No. 189-2 for details.



The 6 x 18″ Surface Grinder

The outstanding durable machine for production of accurate plane surfaces. Catalog No. 954-15 for details.



The 8″ Hydraulic Surface Grinder

At home in tool room or production line. ***Continuous hydraulic cross feed*** a real feature for truing. Catalog No. 190-2 for details.

The Type 16 FC Lapping Machine

The vertical lapping machine that produces optically flat surfaces and thickness tolerances ***in millionths.*** Catalog No. 212-2 for details.

NORTON

GRINDERS LAPPERS

NORTON COMPANY, WORCESTER 6, MASS.

New York • Detroit • Chicago • Cleveland • Hartford

Distributors in All Principal Cities

UNIVERSAL Bulletin 11-50-50m

Printed in United States of America

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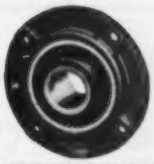
There is a LINK-BELT Ball or Roller Bearing For Every Purpose

- **for light or heavy loads**
  in capacities to hundreds of thousands of pounds.
- **for low speeds or high speeds**
  to 5000 revolutions per minute, rated speeds. Higher speeds upon consultation.
- **for grease or oil lubrication**
  solid housing blocks for grease lubrication. Split housing blocks for either grease or oil.
- **for fixed or floating mounting**
  fixed housings for shaft location, floating bearings to provide for expansion and contraction.
- **for small or large shafts**
  in diameters from ⅝ to 7½ inches.
- **locked-on or pressed-fit**
  to suit commercial shafting or precision finished shafting.
- **with closed or open end**
  closed end for extra protection, open end for through shaft.
- **with solid or split housing**
  solid housing blocks for simplicity, split housing blocks for ease of installation.

FLANGED BLOCK


FLANGED CARTRIDGE BLOCK

HANGER BLOCK

CARTRIDGE BLOCK

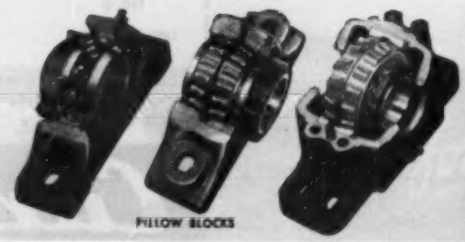
TAKEUP BLOCK

UNMOUNTED BEARING

May we send you the new Link-Belt Ball and Roller Bearing Catalog No. 2550, showing the complete line? A LINK-BELT engineer will make unbiased recommendations.

LINK-BELT COMPANY Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Minneapolis 5, Houston 1, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities.

A complete line of bearings is available from stock, throughout the country, in pillow blocks, cartridge, flanged cartridge, flanged, hanger and takeup blocks—also unmounted bearings.


PILLOW BLOCKS

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BALL & ROLLER
BEARINGS

By Installing CURTIS Air Compressors, Air-Operated Cylinders and Hoists

Plants Everywhere

- Save manhours
- Reduce production costs
- Increase plant efficiency

No better equipment is built for producing air at low cost, or for assuring efficiency in any lifting, pulling or pushing operation.

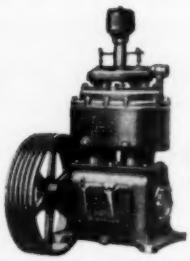
Precision built by a company with 96 Years of "Know-How"—Your assurance of proper performance from the moment of installation.

MODEL F AIR COMPRESSORS

- Timken-Bearing Equipped
- Self-Lubricating
- Centrifugal Unloaded Starting
- Nationally-Known Motor

CURTIS AIR HOIST

- Accurate Finger-Tip Spotting of Loads
- Low-Cost Lifting



CURTIS MODEL C AIR COMPRESSORS

- Water-Cooled
- Up to 50 H.P.
- Fully Enclosed
- Dust and Dirt-proof
- Timken-Bearing Equipped

CURTIS AIR CYLINDERS

For Any Pushing Pulling or Lifting Operation

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Avenue St. Louis 20, Mo.

Curtis

EST. CURTIS ST. LOUIS 1854

CURTIS PNEUMATIC MACHINERY DIVISION 150-2
of Curtis Manufacturing Company
1924 Kienlen Avenue, St. Louis 20, Mo.

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☐ Air Cylinders
☐ Air Compressors

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"It's one of the biggest working improvements in years!" That's what machine operators everywhere say about Cimcool®, the radically new and different cutting fluid.

Naturally operators like their jobs better when they work with Cimcool. It doesn't soil hands or clothing. Can't smoke. Can't burn. And virtually eliminates rancidity and foul odors.

Cimcool is a *chemical emulsion.* It replaces all water emulsions and all but a few highly compounded specialty oils. Jobs are completed faster—better—because Cimcool combines friction reduction and cooling capacity in a degree never attained by old-fashioned cutting fluids. It cools so fast that tools and chips actually stay cool to the touch.

We sincerely believe one week's run will convince you. For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, send for our free booklet "Cimcool Gives The Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U. S. Pat. Off.

A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

For Busy Readers...

AMERICAN MACHINIST IS PLANNED for the production man who is always in a hurry, literally arranged so that "he who *runs* may read". While the entire magnifine is streamlined to save your time, the editors assemble in each issue a balanced diet of data set up for maximum convenience to suit your schedule

FOR ECONOMIC INTERPRETATION IN FIVE MINUTES, READ:

SPOT NEWS—Pertinent paragraphs on new developments
WASHINGTON—The digest of Government for Metalworking
DETROIT—What the bellwether automotive plants are doing
NEW TOOLING—Who's buying what new equipment, and why
GAGING METALWORKING—Current economic and business trends
EDITORIAL—Our point of view on current problems

FOR CAPSULIZED TECHNICAL DATA IN TEN MINUTES, READ:

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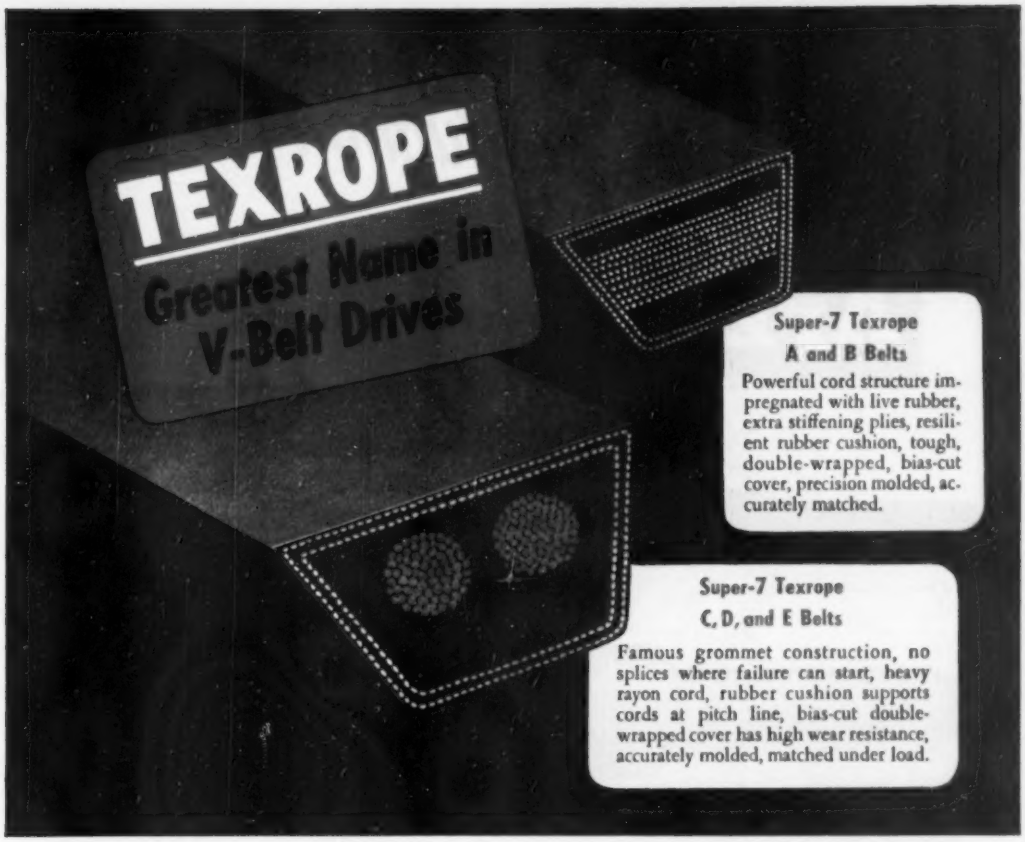
TALENTED TOOLING—How tool engineers tailored machine to job
SHORT CUTS—Kinks to ease shop headaches
REFERENCE BOOK SHEETS—Keepable data in usable form
SHOP SHOTS—Ideas in pictures from the field
ADVERTISING—Many ads show new, or special tooling

IF THE STRESS IS ON PERSONNEL, CHECK:

TIPS TO TOP SHOP MEN—Numbered nuggets on handling people
ROUND TABLE—Two points of view on a tough question
ROUND TABLE DISCUSSIONS—Reader opinions of shop problems

TO ORGANIZE YOUR LONGER READING, READ:

CONTENTS PAGE—Classified by subjects of your major interest
CHIPS & QUIPS—*Why* and *how* the articles were chosen, *what* they tell
ADVERTISING INDEXES—Ads are indexed both by product and by maker, for your quick reference either way
ARTICLES IN AMERICAN MACHINIST are presented in shortest possible compass, as text, pictures, or a combination, depending on subject and available material. This makes your longer reading *shorter per idea*, thus more efficient and more effective. We spend our time to save yours.


TEXROPE
Greatest Name in V-Belt Drives
Super-7 Texrope
A and B Belts
Powerful cord structure impregnated with live rubber, extra stiffening plies, resilient rubber cushion, tough, double-wrapped, bias-cut cover, precision molded, accurately matched.
Super-7 Texrope
C, D, and E Belts
Famous grommet construction, no splices where failure can start, heavy rayon cord, rubber cushion supports cords at pitch line, bias-cut double-wrapped cover has high wear resistance, accurately molded, matched under load.

LONG LIFE FOR YOUR DRIVES

YOU GET MORE than good belts when you standardize on *Super-7 Texrope* V-belts in your plant. You also get the benefit of the greatest V-belt experience in the world. This means you are sure of exactly the right drive for longest life on your job. *Texrope* Drive Department of Allis-Chalmers originated the multiple V-belt drive and there are more *Texrope* multiple V-belt drives in operation than any other make.

High Capacity Belts

These belts have extra strong cords, special rubber cushion and tough neoprene cover to give them 40% greater capacity than standard belts at proportionately higher price. Recommended only for applications where space is limited or other special conditions demand a heavier duty belt. Made in A, B, C, D and E sections.

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Get everything you need for your V-belt drives . . . new and replacement V-belts, standard and variable speed sheaves and speed changers . . . from one reliable source. 144 page *Texrope* Pre-engineered Drive manual covers 90% of requirements. Get your copy today from your A-C Authorized Dealer or Sales Office or write for Bulletin 20B6956.

Texrope and *Super-7* are Allis-Chalmers trademarks. *Super-7 Texrope* V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices.

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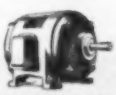

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

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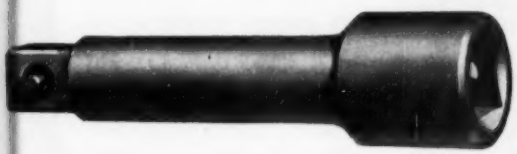
Extensions and Adapters

Hex Drive, Tension Type Universal Wrench



Extension Socket Adapter, Male & Female Square Drive

Driver for Socket Screw

Universal Socket for Hex and Square Nuts

• "Custom-built" to meet specific operating conditions, Apex sockets, universal sockets, extensions and adapters are available in thousands of standard types and sizes. Precisely machined from high carbon, electric furnace alloy steel, Apex tools are cold broached and heat treated to withstand strains and shocks, to provide longer, trouble-free service life.

It costs no more to get the benefits of Apex "custom quality" because the freedom from excessive tool breakage and quick wear-out pays dividends in reduced down-time, increased productive output. Special applications?... just send your sketch or blueprint—we'll quote promptly.

Catalog 19 lists this complete line of Apex production tools . . . a note, on your company letterhead please, will bring your copy.

Square Drive Sockets for Zerk Grease Fittings

APEX

sockets, extensions, adapters

THE APEX MACHINE & TOOL COMPANY

1026 S. Patterson Blvd., Dayton 2, Ohio

SAFETY FRICTION TAPPING CHUCKS • VERTICAL FLOAT TAPPING CHUCKS • SELF-RELEASING AND ADJUSTABLE STUD SETTERS • POWER BITS FOR PHILLIPS, FREARSON, SLOTTED HEAD, CLUTCH HEAD, HEX HEAD AND SOCKET SCREWS • HAND DRIVERS FOR PHILLIPS, FREARSON AND CLUTCH HEAD SCREWS • AIRCRAFT AND INDUSTRIAL UNIVERSAL JOINTS • SOCKETS AND UNIVERSAL JOINT SOCKET WRENCHES

JOE FROM KOKOMO
There once was a dancer who "tapped" on the stage,
He bucked and he winged to a ripe old age!
He tapped 'til he "clogged" in bad condition
And they gave him the "hook" at every rendition!
JOHN BATH CO. INC. · WORCESTER · MASS
HAPPINESS TRIO
MACHINIST
FOREMAN
PRODUCTION MANAGER
Some folks run taps too deep and too long.
They'll clog and break and cut threads wrong!
Keep Bath Taps in condition, always on hand.
Your production will be "in step" with the band!

INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

When Bath Taps leave our plant, expert workmanship and rigid inspection combine to assure plus-performance in your shop. A special Bath process completely hardens the taps to uniform structure before threading, assuring the accurate performance of a precision tool.

Preserving this efficiency is sometimes sacrificed by the operator who (1) runs the tap until it breaks (2) runs the tap until the cutting edge is too worn for proper reconditioning or (3) does not sharpen the tap properly.

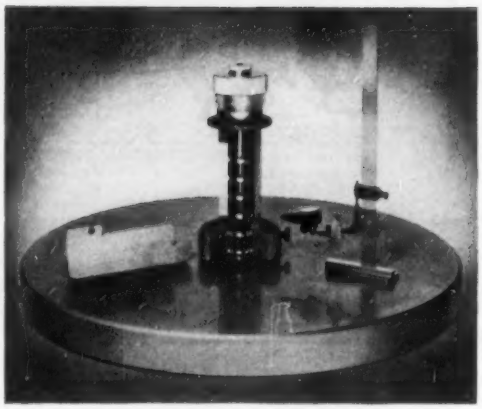
Making a thorough check before every job of the tap style required by the material, of the fixtures and lubrication, will do much to guard against tap and work spoilage . . . will lower the cost per tapped hole. We invite your inquiry on any tap problem . . . ask the Bath representative or write us direct.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

22 Grafton St., Worcester, Mass.

Here's why The



It Is Wear-Resistant

The Norton Ceramic Surface Plate is made of one of the hardest substances known and therefore gives many times the life of any other type. Even with severe production gaging and blueing operations, months of use *without measurable wear* can be expected. In a laboratory test, the Norton plate life was shown to be at least 40 times that of the best competing type. Exhaustive field trials confirmed the results of the laboratory test.

It Is Flat

The Norton Ceramic Surface Plate is guaranteed to be flat within .0001". This precision flatness is important to the accuracy of precision measuring operations. It also helps prevent wear of expensive instrument bases, gage blocks and sine bars.

It Stays Flat

The Norton Ceramic Surface Plate stays flat because it is made of a durable and stable material. It will not warp or deform; it gives no expansion troubles and it will not deflect under load. Furthermore, the wear-resistance of these ceramic plates assures permanent flatness.

NORTON COMPANY
Worcester 6, Massachusetts

NORTON
CERAMIC

you'll want Norton Ceramic Surface Plate

It Is Smooth

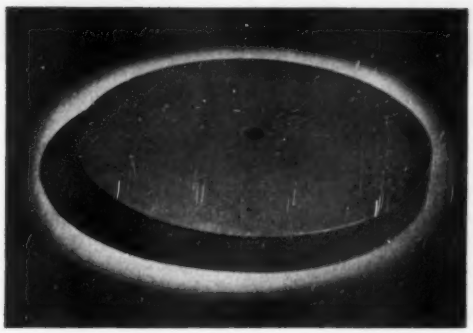
The Norton Ceramic Surface Plate offers a new standard of continuously smooth surface finish. This surface allows easy movement of instruments and work across the plate without excessive drag and without vibration. However, there is sufficient "pull" to give the operator the proper feel for making measurements. The semi-glossy surface is neither slippery nor sticky.

It Will Not Corrode

The Norton Ceramic Surface Plate will never sweat nor corrode no matter how long it is left in any atmospheric condition. Greasing is unnecessary, and the plate does not require any similar protection from moisture.

It Is Ideal for Blueing

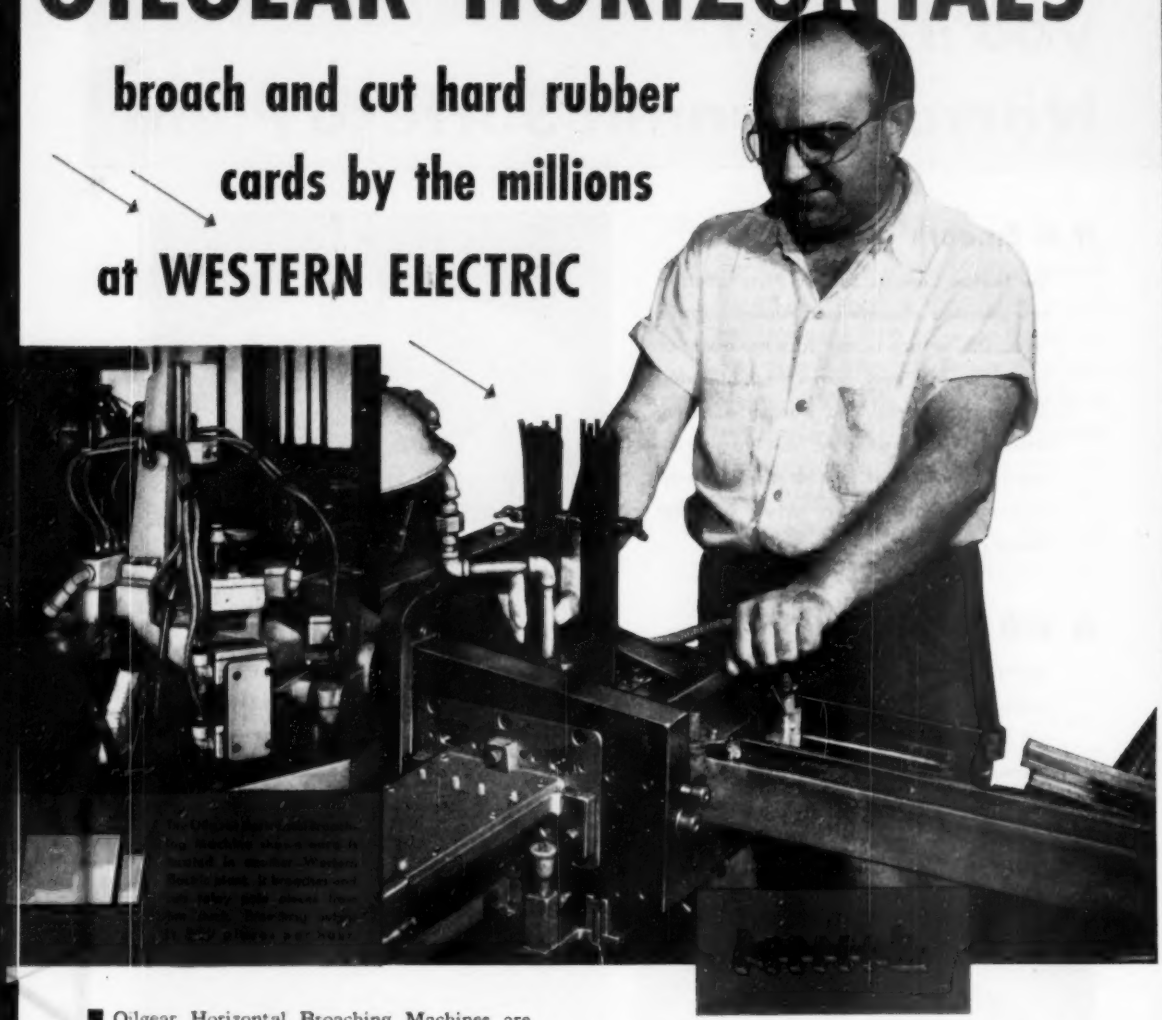
The Norton Ceramic Surface Plate has a special surface texture which makes it ideal for blueing operations. A uniform film is readily transferred from the plate to the work. The blueing mix spreads easily, is moist longer.



SURFACE PLATES

OILGEAR HORIZONTALS

broach and cut hard rubber cards by the millions at WESTERN ELECTRIC



■ Oilgear Horizontal Broaching Machines are used by Western Electric in the broaching and cutting of separators or operating "cards" from hard rubber stock. Used by the millions annually in dial telephone exchanges, these cards must meet precision contour requirements.

A battery of four Oilgear XL-6 x 48″ stroke horizontal broaching machines is used to form-broach and cut these hard rubber cards. Each Oilgear Horizontal broaches and cuts 50 cards in a single pass from bundles of strips (1/16″ x 1¼″ x 23⅜″) that are ground on each side to accurate dimensions. Each machine has a capacity of 12 to 13 million cards per year. These Oilgear Horizontals have been in service a number of years. Elsewhere, Oilgear Horizontals are used to broach and shape similar parts from phenolic stock.

Oilgear Horizontal Broaching Machines indeed have great versatility, can be adapted to many uses, afford great productive capacity. These machines have as standard equipment many features available on no other machines or available only at extra cost. The same performance and dependability that interest careful and rigorous buyers in many industries should interest you. Write for Bulletin 20000B on the Oilgear Horizontals. Also other bulletins on the Verticals. THE OILGEAR COMPANY, 1563 W. Pierce St., Milwaukee 4, Wisconsin.

Oilgear

PIONEERS IN FLUID POWER

BROACHING MACHINES AND PRESSES

WE INCREASED PRODUCTION 71% WITH J&L "E" STEEL

J&L STEEL

(a story* about how to win customers and influence prospects)

"Got a minute? Well, let me tell you about what happened at our machine shop a couple of months ago when we first tried that new J&L "E" Steel. You wouldn't believe it was possible! (Confidentially, neither did we until we proved it to ourselves.) Here's what happened.

"We got an order to produce a big lot of plunger stops for solenoid starter switches. They're tricky to run, and you've got to be pretty careful every second. We'd read about "E" Steel in some of J&L's ads, and decided we might try some on this job.

"So we ordered some 17/32" E-33 "E" Steel stock, set up our B&S #2 and B&S #0 Automatics and began to turn out parts. We had used B-1113 for this job before and had been getting 350 pieces per hour. But we soon realized we could machine much faster with "E" Steel, and **we kept increasing speed until we were getting an average of 600 parts per hour. That's a 71% production increase!**

"Next thing we discovered was that our tools were lasting twice as long and the chips were coming off better with "E" Steel than they did with B-1113. We also found that the finish on the parts had improved from 20% to 25%.

"That's why we've been using "E" Steel. We turn out work much faster and can take on more jobs. Our men like the way "E" Steel machines and our customers get better parts and better service. Everybody benefits!"

Get your copy of the booklet titled "A Progress Report on 'E' Steel." It outlines a series of 11 case histories from machine shops that have used "E" Steel with excellent results. Write for your copy.

*Based on an actual case history.

"E" Steel (U.S. Pat. No. 2,484,231) is easily identified by the distinctive blue color on the end of every bar.

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 30, Penna.

Please send me a free copy of "A Progress Report on 'E' Steel."

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JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

Werk Stunden Sparnis 43%

43% d'économie dans le temps de la production.

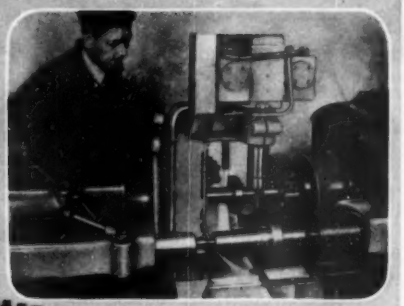
Produktions tiden inbesparade 43%

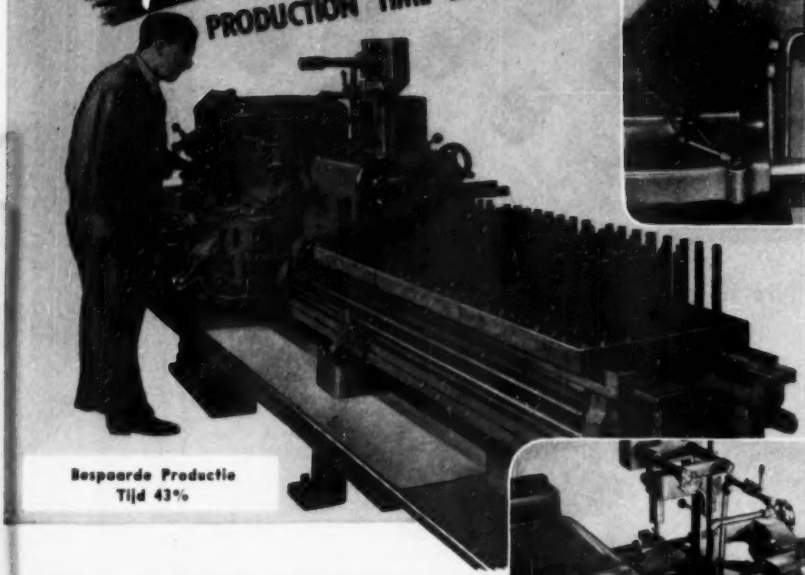
Ersparung an Produktionszeit—43%

43% de ahorro en el tiempo de producción.

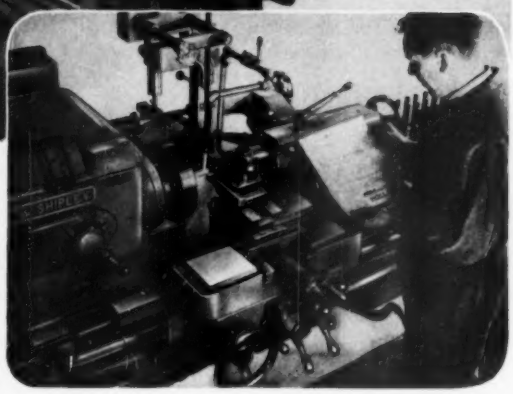
Good in any language...

PRODUCTION TIME SAVED 43%





Bespaarde Productie Tijd 43%



LODGE & SHIPLEY COPYMATIC LATHE in Enkes N. V. Plant, Voorburg, Holland

A lathe built in the United States has to be good to justify the much higher delivered prices in Holland or elsewhere abroad. But, even figuring the higher price due to unfavorable dollar exchange, crating and shipping, duty and other costs, this Lodge & Shipley COPYMATIC paid off . . . production time saved 43%!

Remarkable production is obtained with every COPYMATIC, here and abroad, proved by case histories showing increases of over 200%.

This Dutch manufacturer, making small "petrol engines for bicycles," says, "production is very high for this small precision work." The photos show the COPYMATIC automatically duplicating several forged steel shafts which are rough and finish turned to close limits.

Even smaller shops can profit from the COPYMATIC'S more and better production. It offers all the speed and convenience of hydraulic duplication, plus the outstanding versatility of the Lodge & Shipley "Model X" Lathe . . . with instant changeover.

Write for Bulletin 675.

THE Lodge & Shipley COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

There's a UNION *twist drill for top performance on every operation!*

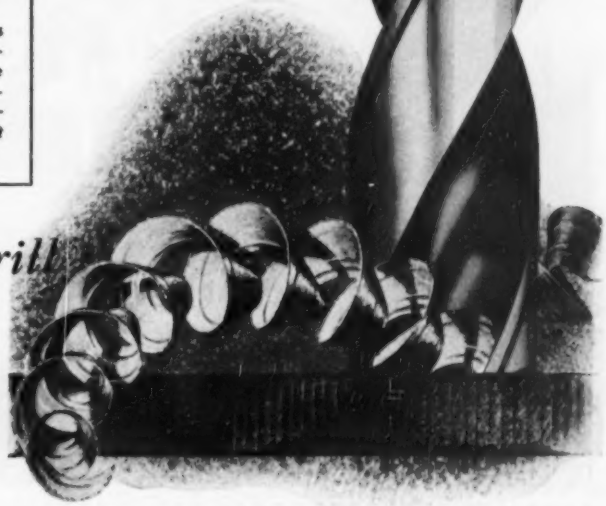
Whether you're working on the hardest alloy steel or softest iron . . . on such non-ferrous metals as brass, copper, aluminum, magnesium or zinc . . . on slate, marble, rubber, plastics, wood or any other non-metal . . . there's a type of Union Twist Drill that will give you tops in accurate, trouble-free, money-saving performance.

That goes, too, for a normal working pace or for high production records . . . and for every type of drilling equipment. No matter what the material or the conditions, *you're sure of best results when you specify Union!*

Union Twist Drills, Straight and Taper Shank High Speed Steel, with Blue Oxide Surface Treatment.

SERVICE THAT SAVES YOU TIME, TROUBLE, MONEY

Union Twist Drills are made in designs that cover the broadest range of operations. To aid you in choosing exactly the right type and size of drill for your particular applications — usual or unusual — your Union service man offers expert assistance. Call on him any time.



no other twist drill will outperform a UNION

contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist."

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

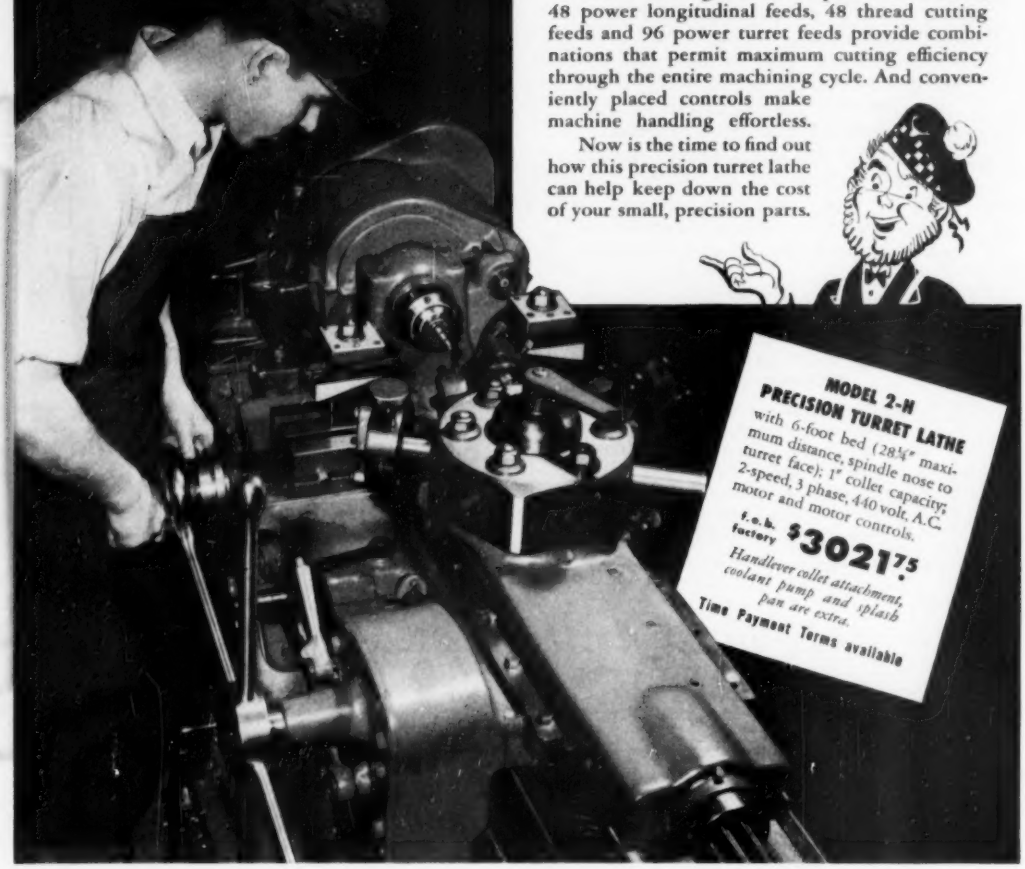
SOUTH BEND 2-H TURRET LATHE

Keeps Costs Down on Precision Parts

This precision-built turret lathe is designed specifically for the machining of accurate, duplicate parts. It is especially suited for large-volume, second operations that require close tolerances and smooth finishes.

The wide ranges of its 48 power cross feeds, 48 power longitudinal feeds, 48 thread cutting feeds and 96 power turret feeds provide combinations that permit maximum cutting efficiency through the entire machining cycle. And conveniently placed controls make machine handling effortless.

Now is the time to find out how this precision turret lathe can help keep down the cost of your small, precision parts.



MODEL 2-H PRECISION TURRET LATHE

with 6-foot bed (28¾" maximum distance, spindle nose to turret face); 1" collet capacity; 2-speed, 3 phase, 440 volt, A.C. motor and motor controls.

f. o. b. factory **$3021.75**

Handlever collet attachment, coolant pump and splash pan are extra.

Time Payment Terms available

SOUTH BEND LATHE

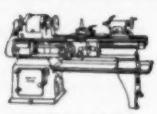
SOUTH BEND 22, IND. • *Building Better Tools Since 1906*

Send Information on:

☐ LATHE ATTACHMENTS

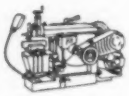
☐ 2-H TURRET LATHE ☐ TIME PAYMENT PLAN

☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES

☐ 14" DRILL PRESSES



☐ 7" BENCH SHAPERS

NAME _____ COMPANY _____

STREET _____ CITY & STATE _____

THE KNIGHT NO. 40

DOES THE WORK OF TWO OR MORE MACHINES

Here's Why-

1. A tilting, swivel table that entirely eliminates special jigs, angle plates and other expensive fixtures usually required for special or complicated milling, boring or shaping jobs.

2. Exceptional capacity and flexibility make it easy for the Knight No. 40 to do jobs which often require transfers to two or more special machines.

3. Sixteen table and spindle feed changes plus four vertical spindle feeds allow the use of a wide range of cutting tools.

4. Correctly located full vision controls for direction, speeds and feeds provide the most in convenient, simple operation.

5. Heavy, strong, one-piece column casting, wide accurate bearings and precision gearing insures the rigidity which means absolute accuracy and long service life.

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W. B. KNIGHT
MACHINERY COMPANY

KNIGHT VERSATILE ACCURATE MILLING

3920 WEST PINE BLVD.
ST. LOUIS 8, MISSOURI

ATTACH TO COMPANY LETTERHEAD

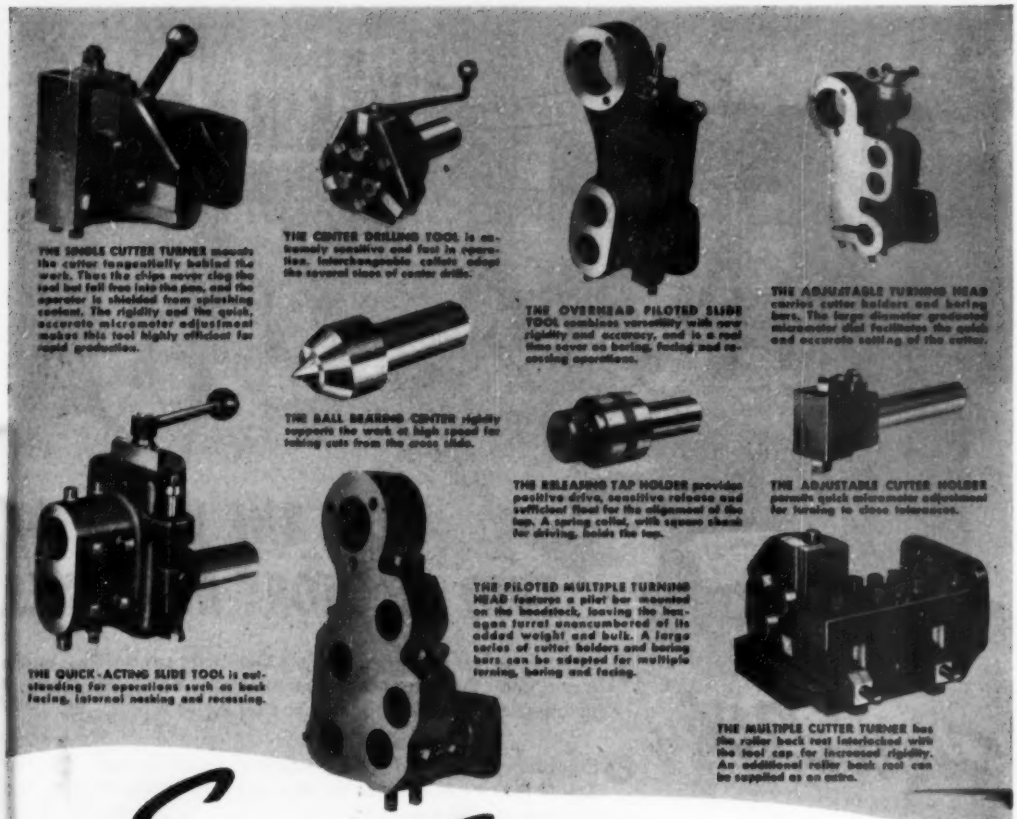
W. B. KNIGHT MACHINERY CO., 3920 West Pine, St. Louis

Send catalog on Knight No. 40 and other milling machines.

Name _____

Title _____

MORE GOODS for MORE PEOPLE at LOWER COST



THE SINGLE CUTTER TURNER mounts the cutter tangentially behind the work. Thus the chips never clog the tool but fall free into the pan, and the operator is shielded from splashing coolant. The rigidity and the quick, accurate micrometer adjustment makes this tool highly efficient for rapid production.

THE CENTER DRILLING TOOL is extremely sensitive and fast in operation. Interchangeable collets adapt the several sizes of center drills.

THE OVERHEAD PILOTED SLIDE TOOL combines versatility with rare rigidity and accuracy, and is a real time saver on boring, facing and recessing operations.

THE ADJUSTABLE TURNING HEAD carries cutter holders and boring bars. The large diameter graduated micrometer dial facilitates the quick and accurate setting of the cutter.

THE BALL BEARING CENTER rigidly supports the work at high speed for taking cuts from the cross slide.

THE RELEASING TAP HOLDER provides positive drive, sensitive release and sufficient float for the alignment of the tap. A spring collet, with square shank for driving, holds the tap.

THE ADJUSTABLE CUTTER HOLDER permits quick micrometer adjustment for turning to close tolerances.

THE QUICK-ACTING SLIDE TOOL is outstanding for operations such as back facing, internal necking and recessing.

THE PILOTED MULTIPLE TURNING HEAD features a pilot bar mounted on the headstock, leaving the hexagon turret unencumbered of its added weight and bulk. A large series of cutter holders and boring bars can be adapted for multiple turning, boring and facing.

THE MULTIPLE CUTTER TURNER has the roller back rest interlocked with the tool cap for increased rigidity. An additional roller back rest can be supplied as an extra.

Efficient Tools on your Turret Lathe

MEAN HIGHER PRODUCTION AND LOWER COST...

THE TOOLS SHOWN constitute only a few of the hundreds of different kinds and sizes of turret lathe tools that we build. Bardons & Oliver tools are outstanding in design and efficiency of metal removal, in ease of accurate size adjustments, and high quality of finish produced.

While these tools are designed primarily for use on the Bardons & Oliver ram and saddle type turret lathes, many of them can be applied to render other makes of turret lathes capable of increased production.

The latest cemented carbide cutters can be used to their full productive capacity in Bardons & Oliver tools.

These two tool catalogs will help you to select the proper tools for your turret lathes. Your copies will be mailed promptly, upon request.

We build a complete line of ram and saddle type turret lathes, also automatic and hand operated cut-off machines.

BARDONS & OLIVER, INC.

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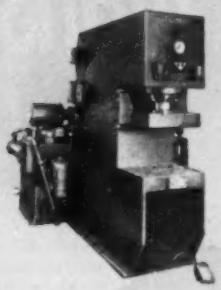
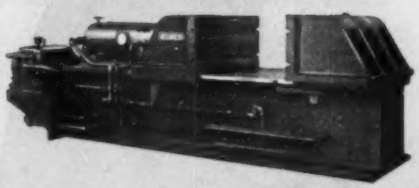
WHEN A STANDARD PRESS WON'T DO...

100-TON AUTOMATIC HYDRAULIC OPENSIDE PRESS



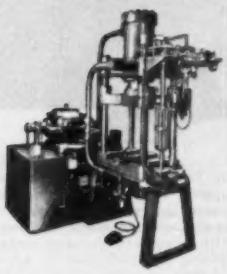
An entirely new design originated by Elmes engineers to meet specific requirements of a large farm implement manufacturer. Problem was to accomplish in a single press stroke the shearing, riveting, and straightening of forged steel work subject to variations in thickness. Utilizing the superior advantages of hydraulic power, with its variable cycling rate, this special press performs the required 3 operations per stroke at speeds up to 35 cycles per minute.

HYDRAULIC BULLDOZER



Example of an existing Elmes design with various dimensional modifications. In this particular press the speed of operation, tonnages, size of press opening, and dimensions of work area were all made to the customer's individual specifications.

HYDRAULIC TUBE BENDER



A standard Elmes press modified for a specific kind of work by the addition of a specially designed new feature. Job requirement is heavy-duty, high-production tube bending where many different bends must be made in the work. A special indexing device regulates depth of bends and provides 1 to 12 different bends in succession, with automatic reset.

Call in ELMES *for a* Special Press

custom-engineered to meet your job requirements

Designing special hydraulic presses to meet unusual job requirements has always been a major function of Elmes engineers. Whether you need a press newly designed throughout, or one embodying changes from existing designs, Elmes century-long background plus advanced engineering skill and the most modern production facilities are your best assurance of satisfaction.

In standard presses, Elmes service is equally complete. The Elmes standard line includes a full range of hydraulic metal-working presses, hobbing presses, forcing presses, laboratory presses, and compression and transfer molding presses.

All Elmes equipment, standard or special, provides the superior advantages of hydraulic power . . . full power exerted at any point in the stroke . . . length of stroke and pressing force variable to suit work.

The Elmes engineering staff is always available for counsel, recommendations, and cost estimates. When *you* have a "pressing problem," it will pay you to *call in Elmes.*

ELMES 100th Anniversary 1851-1951 HYDRAULIC EQUIPMENT

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Covers single-action, double-action, and triple-action presses . . . standard designs . . . special applications . . . automatic feeds. Ask your Elmes distributor or write direct for Bulletin 1010-B.

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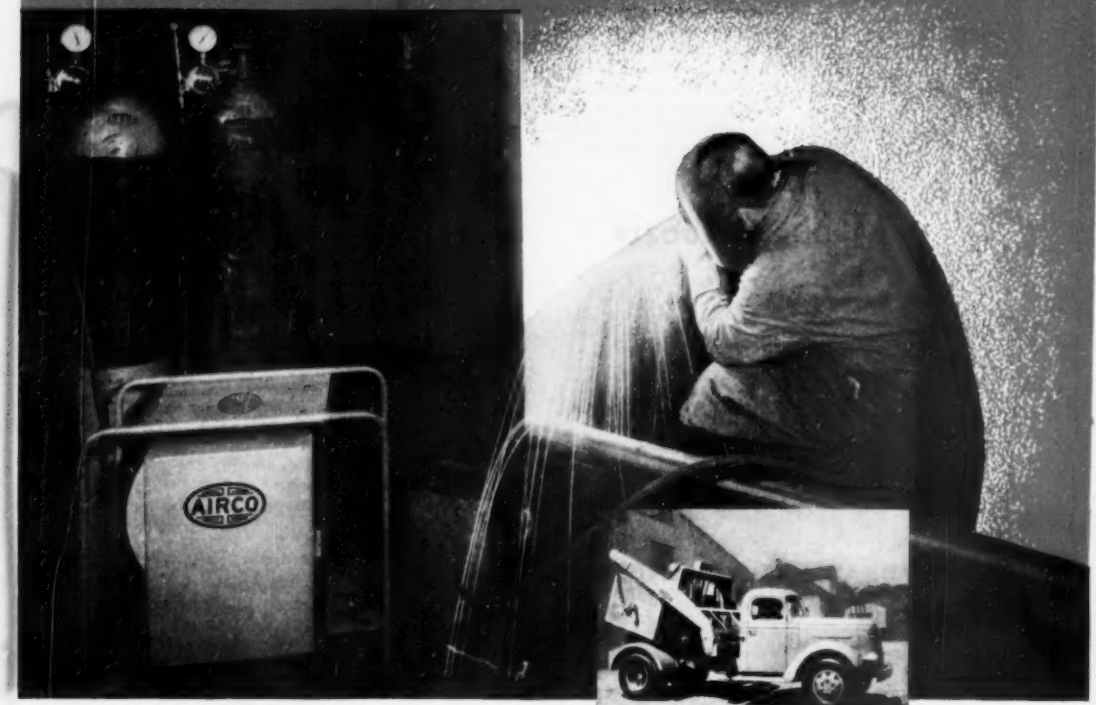
NEW Aircomatic® Process jumps Welding Speeds to NEW HIGHS



Aircomatic is a new metal arc welding process that permits high-speed welding of aluminum, of aluminum bronze and of stainless steel – *in all positions.*

The process uses a bare wire electrode in coil form, continuously fed to the work within an inert gas shield. High current densities are used providing excellent penetration and high deposition rates, *permitting welding at speeds greater than ever before possible.*

Aircomatic welding has proved most economical . . . for its high deposition rate, in addition to permitting high travel speed, also makes possible fewer passes on heavy material, an 1 faster, heavier deposits for overlay or build-up work. This means more weld per unit of arc time, whatever the job. Further, since the wire is bare and continuously fed through a shield of inert gas, electrode changes and slag removal interruptions are eliminated, thus permitting almost 100% arc time in using the high operating speeds.

SAVES 16 MAN-HOURS WELDING TIME . . . Dempster Brothers, Incorporated of Knoxville, Tenn., makers of the nationally-known "Dempster-Dumpster" found Aircomatic welding cut their aluminum container manufacturing costs.

The other method was slow – cumbersome, and ran the cost exceedingly high. With Aircomatic the same container was produced – at a welding cost reduction of approximately 16 man-hours.

Another important feature of Aircomatic welding is its minimization of distortion. This is due to its high speed operation (heat can be concentrated and moved rapidly along the work), plus the fact that a small amount of weld metal is all that's required in most joints.

The case studies on the opposite page show how this dramatic new welding process is helping others. While the facts and figures are startling, they could very easily be applied in your own shop . . . but find out for sure. Write . . . or phone your nearby Airco office. Ask for a copy of ADR 66: "Aircomatic Welding Process".

SAVES 4½ HOURS . . . Martin-Quaid Co., of Philadelphia, Pa., used the New Aircomatic Process to reduce the time and cost of welding huge stainless steel cylinders used in the manufacture of carpets. They found this revolutionary process cut materials cost 25% . . . and saved 4½ hours working time over the old method – and, at the same time, greatly increased the quality of the finished product.

REDUCES TIME ⅘'s . . . Consolidated Welding and Engineering Company, of Chicago, Ill., adopted the new Aircomatic process for welding aluminum separators. Immediately, major production and cost problems were solved: To weld one complete separator assembly took only 90 man hours – about 1/5 the time of other methods.

Further, Aircomatic's high current density and the attendant high welding speed confined the heating effects to the narrow weld-zone . . . completely eliminating distortion.

ELIMINATES LEAKS . . . Griffin & Company, of Louisville, Ky., found Aircomatic's high speed and the ability to make welds without interruption ideally suited to the fabrication of tanks for all-aluminum evaporative coolers. Production time and cost was cut to the minimum, and warpage and distortion were completely eliminated. Thus far, the company has made hundreds of these tanks without a single leak.

BOOSTS PRODUCTION 71% . . . The Stewart-Warner Corporation, South Wind Division, Indianapolis, Ind., join the upper and lower halves of its "Safe-Air Gas Home Heater" with the completely new, high-speed Aircomatic Process. This time-saving, cost-cutting process skyrocketed production 71% . . . and cut manufacturing costs in proportion.

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TOOL HOLDERS...
for every operation!

There are **ARMSTRONG** Tool Holders in sizes and types for every operation on lathes, planers, slotters and shapers —for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED, ARMALOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

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HYSTER 75	7,500 lbs.	KARRY KRANE	10,000 lbs.
HYSTER 150	15,000 lbs.		

—and on these HYSTER *Salsbury* TURRET TRUCKS:

Model	Capacity	Model	Capacity
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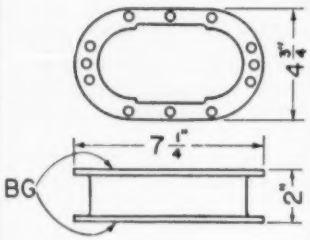
BLANCHARD *is BEST...*

for roughing and finishing parts such as these



Pump bodies are typical of a wide variety of jobs requiring one operation to remove stock from the rough casting, then a finishing operation for extreme flatness and close size tolerances.

For heavy roughing, use the Blanchard No. 18. On this job, 22 pump bodies are rough ground in one chuck load. .100" is removed per side.

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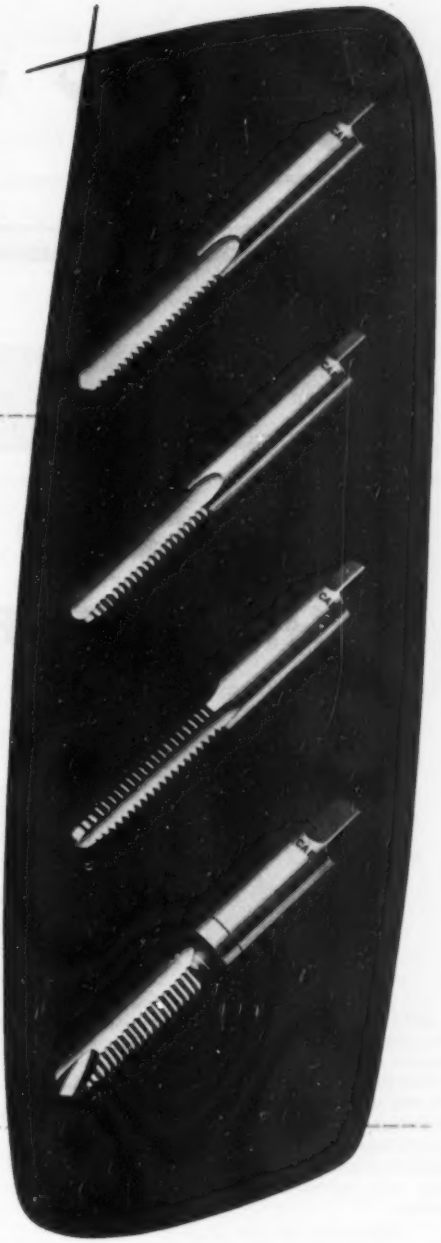
Your nearby Card Distributor will be glad to supply you with these accurate, top quality taps — and to cooperate with you in every way. Contact him for prompt, helpful service.



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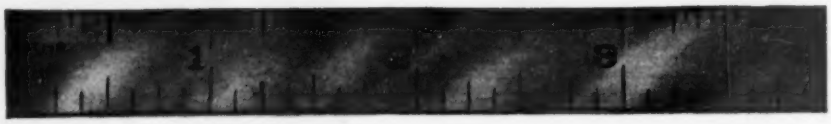

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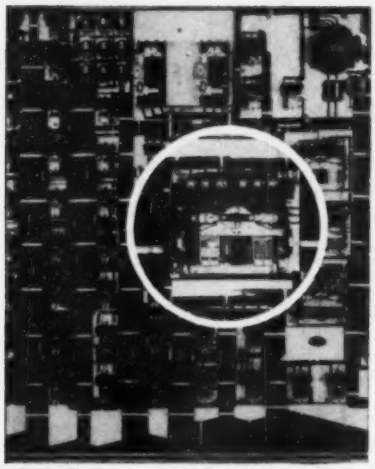

BEAUTY BY THE MILE

Maybe it isn't important that a control panel be beautiful except that in the case of Snyder panels the beauty is the result of the perfect orderliness of the layout. Every circuit can be traced, clearly and easily. Every cycle is protected, when desirable, by interlocks to prevent machine damage through electrical failure. Every panel is provided with manual operation for tool set-up. All conform to established standards. Miles of wire are set into the panels yearly, every inch with such precision and neatness that our panels are notably compact. Building these beautiful panels in our own shop makes us independent of outside delivery dates, gives us close coordination during building and testing each machine and enables us to deliver a better job that saves you money in the long run.

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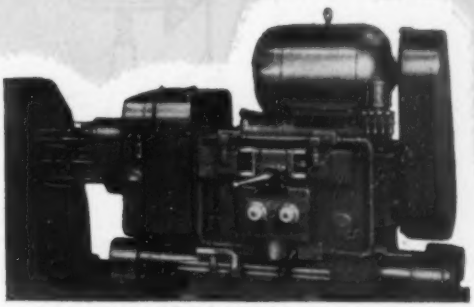
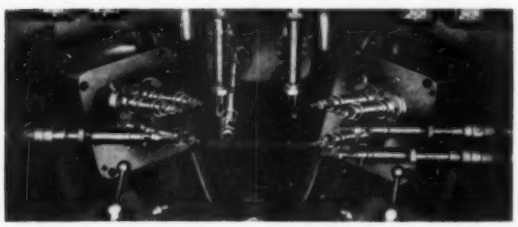
We think we've done an exceptional job on our standardized component units, used on most of our machines. All units, whether way or guide bar type, have hardened and ground bearing surfaces. They provide any required stroke up to 24", yet, create no problem of overhang on extended stroke, as do ram-type units. They are so adaptable and so well built that they can be re-tooled over and over again thereby delivering substantial savings in machine investment since retooling can give you an entirely different operation at minimum cost. Special units are designed with the same objective—to give you durability and versatility that will save you money in the long run.





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A good many years ago we satisfied ourselves that the individual lead screw type of tapping head is the most effective means of leading taps into the work and established it as our standard equipment. This method permits proper speed selection for each individual tap; produces a more accurate thread; eliminates the hazard of thread-stripping. Threads of the lead screw are precision ground after hardening. Snyder safety tap drivers are used exclusively to eliminate tap breakage. Lead screw tapping nuts are of the finest bronze and are replaceable. These features have satisfied the precision requirements of ordnance and aircraft work. They will satisfy you and save you money in the long run.

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American industry is now rapidly adopting a "fourth dimension" – a method of specifying tolerances for surface finish. This new "dimension" has the same advantages as lineal tolerances. Engineers can now specify finish to fit each requirement. Production men can now grind parts to specifications without wasting time and money getting a finish "a little better just to make sure." Bryant has designed its line of internal grinders so that the "fourth dimension" as well as lineal tolerances can be considered when the machines are being set up for production. Optimum production of parts to specified size and surface finish can be maintained by means of adjustable feed rates.

Bryant Chucking Grinder Company is prepared to give you accurate figures on production and costs so that your management can translate them into terms of investment. Send your present production figures to Bryant now. We will give you data which may help you buy that much needed machine.

Remember—it won't cost to inquire.

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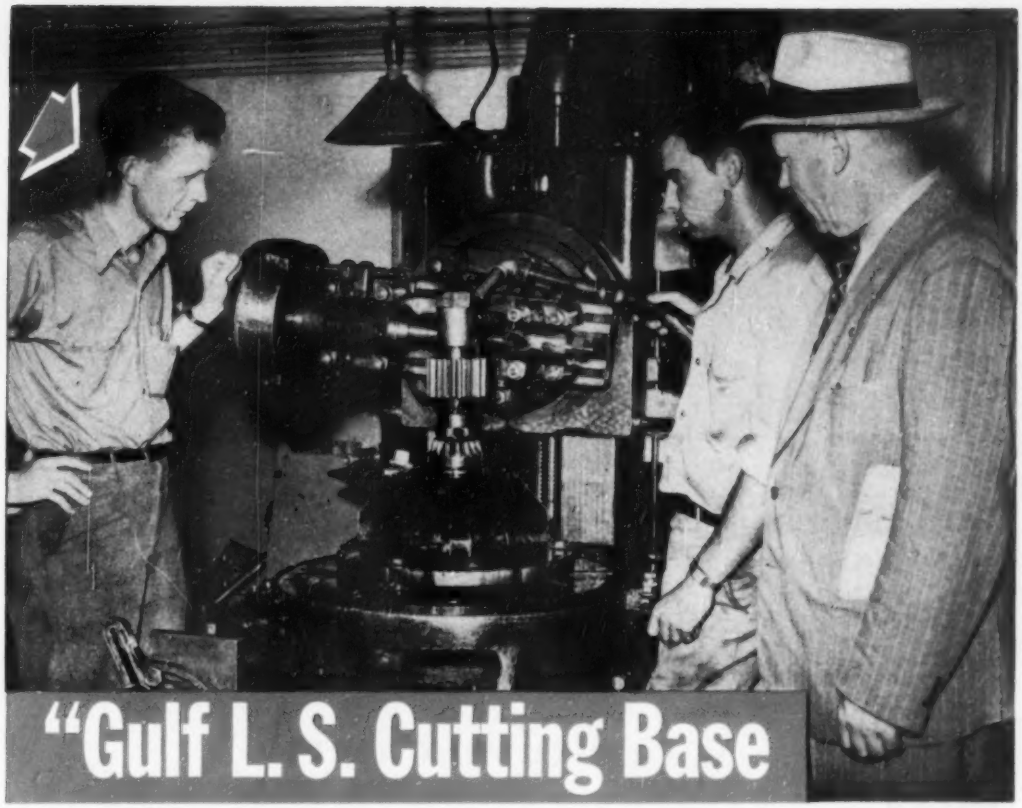

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replaced **3** other oils for gear hobbing – and does a better job"

says this Foreman

"We formerly used three different cutting oils in our gear hobbing department," says this Foreman. "Now we use only one on all machines—Gulf L.S. Cutting Base. It's doing an excellent job—we're getting better finishes and in some cases have been able to increase production. And of course our storage and handling problem has been simplified by elimination of two cutting oils from our inventory."

A typical report from the scores of plants which have made some improvement in machining practice through the use of Gulf L.S. Cutting Base, the outstanding multi-purpose cutting fluid.

Call in a Gulf Lubrication Engineer today and let him help you find opportunities for greater production at lower cost through the use of one or more of the quality cutting oils in Gulf's complete line. Write, wire, or phone your nearest Gulf office.

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Write for the information filled Madison Catalog. It is yours for the asking.

Tools for rough boring; finish boring; combination rough and finish boring, multiple cutting, bottoming; and other special tools.

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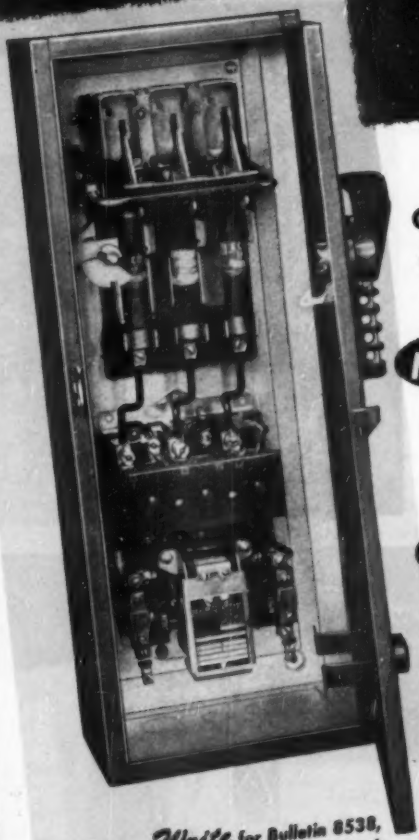

THIS NEW SQUARE D COMBINATION STARTER (SWITCH TYPE) offers Greater Operator Safety and Longer Motor Starter Life

NEW ***Switch Operating Mechanism*** provides maximum operator safety. Interlock prevents opening door when disconnect is on. When door is re-closed, self-aligning handle indicates true position of disconnect. Operating handle can be locked on or off with one, two, three or four padlocks of varying sizes. Handle-locking mechanism also locks door.

NEW ***Switch Design*** has quick make and quick break action—no dead center—visible blades for easy checking—magnetic arc plate for high rupturing capacity—dead-front line terminals, protected by hinged arc chamber cover—positive pressure jaws and fuse clips—non-tracking insulation.

NEW ***Features in Magnetic Starter Design*** Square D's time-proven design has always provided easy installation, simple maintenance, and long life. Now, even longer life is assured by straight line, guided motion of armature and movable contact assembly which eliminates bearing and reduces wear. For added convenience and flexibility, Square D starters now have NEMA standard mounting and wiring.

Write for Bulletin 8538, SQUARE D COMPANY, 4041 North Richards Street, Milwaukee 12, Wis.

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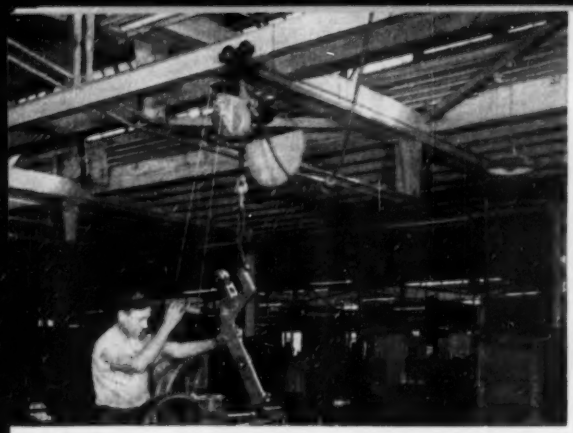

thumbs down...

on high handling costs

Put thumbs down on handling costs and you are putting your fingers on the place where you can effect the largest and most immediate savings. Material handling doesn't add anything to product value... it just subtracts from profits. And since you can't produce without moving materials, your best bet is to cut its cost.

Here's how! Substitute Yale industrial dial scales, hand lift and power trucks for costly raw muscle power. Then watch your high handling costs go "over the hill" . . . your profits increase.

Use of Yale Material Handling Machinery in your plant may be the answer to the ease of performance... the production economies you have been looking for. For more information on how to put thumbs down on handling costs and effect valuable saving in time, money and effort, phone or write today.

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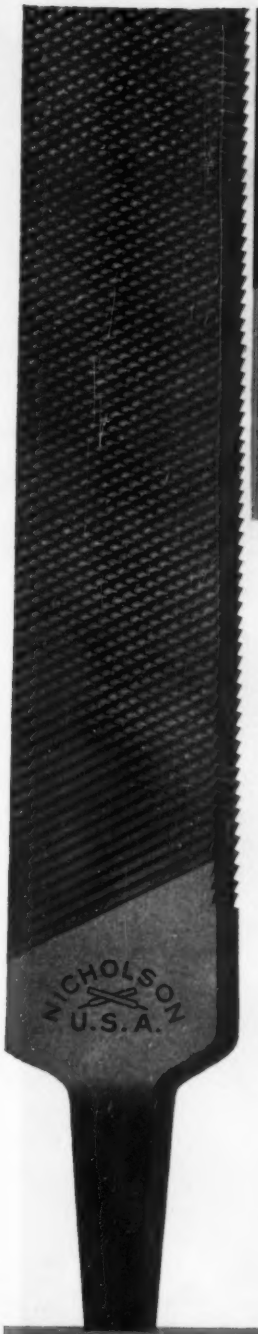


Ten thousand teeth

and every one a working tooth!

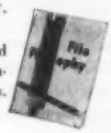
A FILE with a lot of its teeth shorter than their neighbors is about as efficient as a farmer's harrow with some of its spikes missing, a pitchfork minus a tine, or a chair with a broken leg. . . . It just can't do a good job, can't do as much work, can't give you your money's worth.

Since there is no "give" in a metal surface, short teeth in a file are almost totally useless. Chances are they're not sharp even after the higher ones have worn down to their level.

Uniform height and sharpness of file teeth are largely a matter of file-cutting precision — an important manufacturing detail in which Nicholson file-cutting machines are considered tops. Squint your eye along the working surface of a Nicholson or Black Diamond file and note how completely Accuracy is in the saddle.

And what you can't see, but still is there, too, are the toughness and uniform hardness of those teeth. If proof is wanted on that score, a patient count of the number of efficient filing strokes in a Nicholson or Black Diamond file will bring you the answer.

EXTRA-QUALITY "GRADE A" is the banner under which these world-famous files come to you through your industrial distributor.



FREE BOOK, *"FILE FILOSOPHY"* — 48 interesting, informative illustrated pages on the manufacture, kinds, use and care of files. Available to executive, purchasing and production heads, shop foremen, key mechanics. Send for it.

NICHOLSON FILE CO., 29 ACORN ST., PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON A FILE FOR EVERY PURPOSE

EACH AND EVERY
UNIVERSAL
DRILL BUSHING
IS TESTED FOR HARDNESS

Which assures longer bushing life

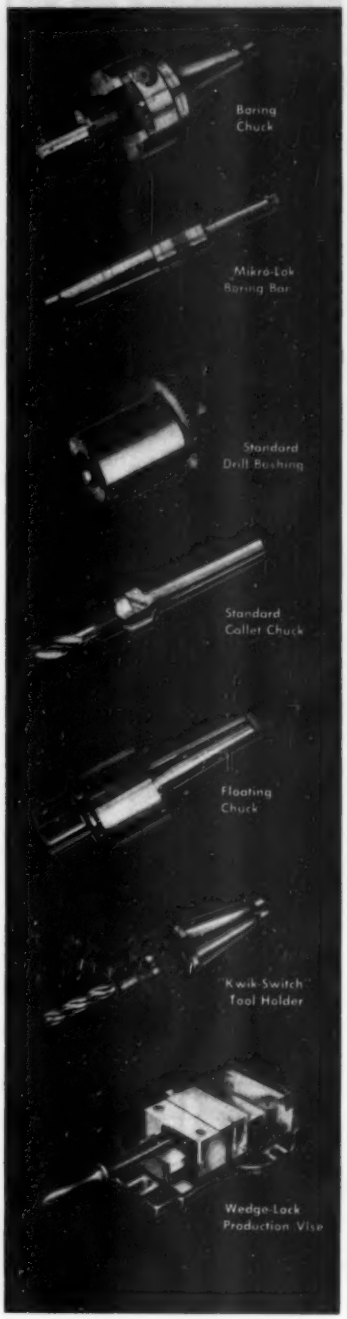
Universal Engineering's policy of checking for hardness every single bushing that comes off the production line is *your guarantee of absolute uniformity* and longer bushing life. All heat treating is done right in the Universal plant. This complete control from start to finish means less flaws occur and those few that do are immediately weeded out by Universal's 100% hardness tests. Super finish I.D., blended radius, knurled head, I.D. break and chamfered O.D. are some of the other *Universal features that mean customer satisfaction.* Order by teletype, phone, wire or letter from your nearest Universal warehouse at 1060 Broad Street, Newark, N. J.; 5035 6th Avenue, Kenosha, Wisconsin or Frankenmuth, Michigan.

145

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 1, MICHIGAN

Facilities available for special hardened and ground precision parts made to customer specifications.

OTHER UNIVERSAL PRODUCTION TOOLS



Production Pointers from GISHOLT

COST CUTTING IDEAS

Gisholt—A Unique Service in the Machine Tool Industry. Here you obtain unbiased help on your turning problems, because Gisholt's broader range of equipment includes both manually operated turret lathes and automatic lathes. Gisholt's recommendations are made without prejudice for one type of machine over another.

FAST 2-OPERATION JOB MADE FASTER BY RAPID CHANGEOVER OF NO. 12 HYDRAULIC

Minimum Tooling Meets Total Production Requirements

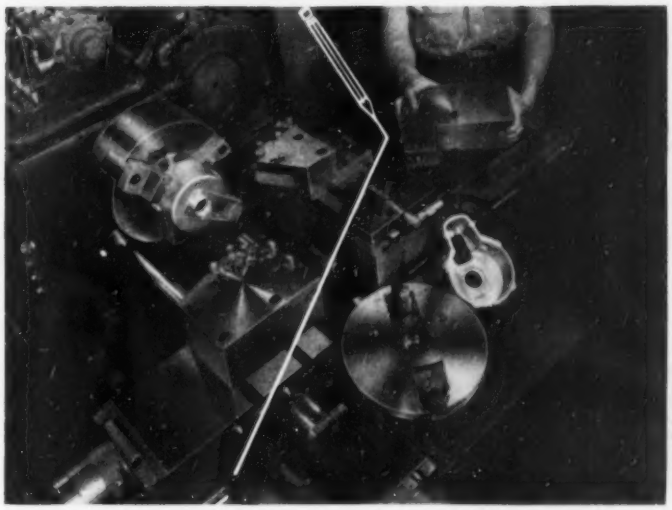
The low floor-to-floor time for both machining operations on these aluminum housings is typical of the efficient production you can expect from this machine. It takes but 1 minute flat for the 1st operation and only 1.5 minutes for the 2nd And, the same machine is used for both operations. The total changeover time between operations is just 15 minutes.

Smart Planning

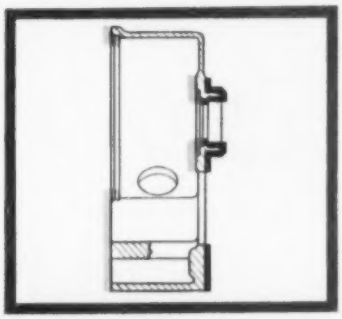
Careful planning makes this possible. Interchangeable tool blocks are mounted on the front carriage with the same mounting holes. The rear tool block is so designed that the tool bits can be quickly repositioned. Even the holding fixture is arranged so that it bolts on to the face of the 1st operation chuck. Everything is planned for a minimum of changeover effort and time.

Operator Tends Other Machines

Not only is the low changeover time important, but the operator is free to handle other machines during the automatic cycle. Whether you have high or low production, this economical, single spindle machine should be investigated. Write for free literature on the No. 12 Hydraulic Automatic lathe.



The line separates the tooling for the two operations on this housing. Tooling on the machine covers the 1st operation and tooling at the right covers the 2nd operation.



A single No. 12 Hydraulic Automatic Lathe performs both machining operations on the aluminum housings.

■ Surfaces machined 1st operation

▒ Surfaces machined 2nd operation

TO GET MORE OF YOUR MONEY'S

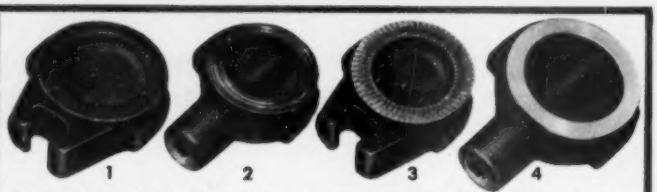
TURRET LATHE AND ROLLING "MILL" IN ONE!

Valve Wedges Machined and Seat Rings Rolled-in —All by 1 Gisholt

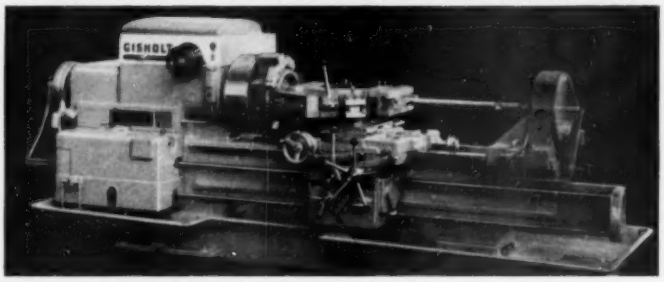
Look how a little brainwork and the adaptability of Gisholt Turret Lathes paid off on this job.

It used to be that *three* machines were needed for machining these gate valve discs and for rolling in the seat rings. Now, with the addition of an air-operated pusher bar to a standard 2L Turret Lathe, all operations are performed on this *one* machine in one chucking.

You can imagine the benefits: saving handling time and costs, freeing two machines for other work and lower labor requirements.



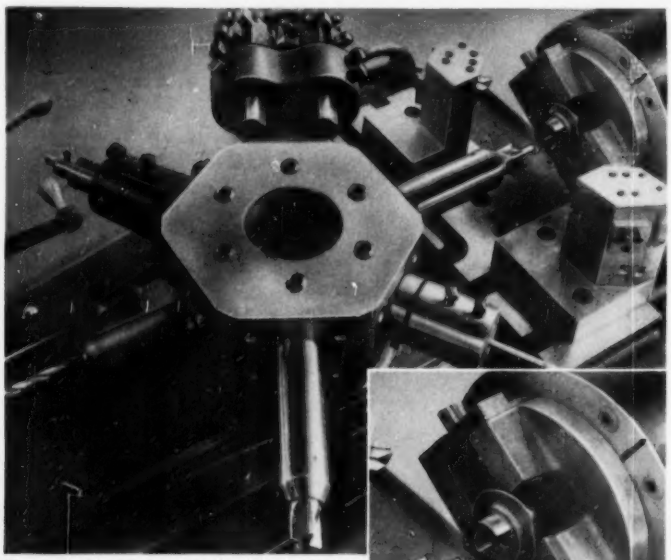
One Gisholt does all jobs on these 2 types of gate valve wedges. 1. Shows the rough casting. 2. After being faced and grooved with dovetail recess for the seat ring. 3. With seat ring rolled in. An air cylinder with pusher bar provides required force to rollers carried on third turret face. Number 4 is completed valve wedge after seat ring is faced, turned and chamfered in place.



The Gisholt 2L Saddle Type Turret Lathe for this job is equipped with cross-feeding turret, air-operated chuck and pusher bar.

SMART HEADWORK SPEEDS MACHINING OF PUMP BODY CRESCENT

There are two interesting features to this job—each a story in itself



This pump body crescent is rough and finish turned in a single pass on a No. 4 Ram Type Turret Lathe. Inset shows enlarged view of crescent and off-center hole.

Rough and Finish Turning in One

It isn't often that you can rough and finish at the same time. But, it's being done in this case because the surface is crescent shaped and not a full circle. The rough and finishing tools on the turret are mounted 180 degrees apart in a special multiple turning head. While one tool is cutting, the other has no contact with the work—hence, no tool interference. Thus, the job is rough and finish turned in a single pass.

Eccentric Machining; Same Chucking

To complicate the job, the center hole and inside of the crescent were not concentric with the outside surfaces. So, a special eccentric chucking fixture was balanced for two positions and then mounted on the spindle. As soon as the turning and facing are completed, the fixture is moved to the new position to put the inside surfaces on the spindle centerline. Then, conventional centering, drilling, reaming and counterboring are done from the turret.

Headwork pays off! Submit your "special" problem to Gisholt.

GISHOLT

OVER-AGE MACHINE TOOLS MEAN

WORTH OUT OF MAN-HOURS

PULLEY MACHINING TIME SLASHED FROM 39 TO 13 MINUTES BY FASTERMATIC

GISHOLT COST CUTTING IDEAS

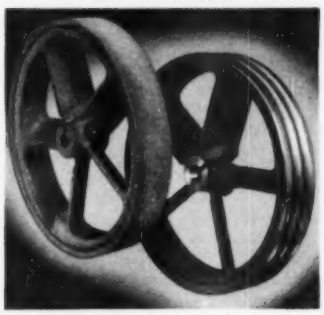
V-Belt Pulleys Finished 66% Faster—and in 1 Operation

Machining time and costs were cut exactly two-thirds when a Fastermatic Automatic Turret Lathe took over the production of these cast-iron compressor pulleys. Even more savings are in order since the operator is able to handle a manually controlled machine in the *free* time the automatic operation of the Fastermatic provides him.

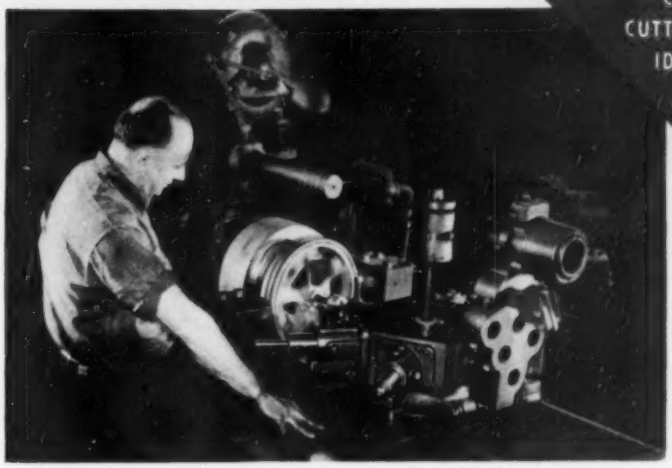
The broad range of spindle speeds and feeds of the Fastermatic are extremely valuable on this job where R.P.M.'s move from 36 to 184. The slow 36 is the desirable speed for machining out the V-belt grooves on the rim with form tools. For finish boring of the hub, speed goes up to a high 184.

Simple Tooling

Simple tooling is arranged with all machining completed in a single chucking. The operation includes rough and finish turning the O.D., and the two grooves, side facing, rough and finish boring and chamfer of the hole and, last, spot facing of the hub. New floor-to-floor time —13 minutes! Old time, 39 minutes.



Only 13 minutes elapse from this rough iron casting to the finished pulley.



Close-up of the Fastermatic tool set-up for machining pulleys. After loading, the machine cycle is completely automatic.

IT'S DUCK SOUP FOR THE SIMPLIMATIC!

Both Ends Machined at Once!

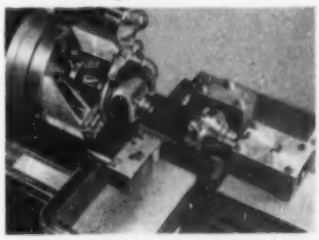
This time the Simplimatic Automatic Lathe shows its speed on a differential carrier job. There are two separate groups of tooling which give a snappy floor-to-floor time of 1½ minutes.

The first tooling group covers the conventional front and rear slides. These turn two of the large diameters on carrier body, and face the outer flange for the ring gear seat.

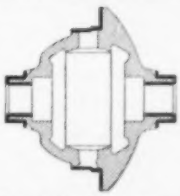
The second group consists of identical tooling on both the standard center slide and on the back boring attachment, which feeds longitudinally through the spindle. As these two sets of tools move together both hubs are bored, faced and turned in a single chucking.

With a set-up like this, you are machining 11 surfaces. You are saving an added operation (and the handling cost) by machining both hubs in but a single operation.

Another good example of saving with the Simplimatic.



The Simplimatic machines 11 different surfaces on both ends of this differential carrier in 1¼ minutes cutting time.

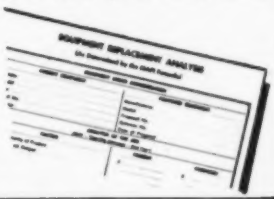


Simplimatic handles heavy surfaces in 1 operation. Part is chucked on large OD.

Now Ready! Your "Equipment Replacement Analysis" Forms

At last, here is a simple guide as to when old machine tools of all types should be replaced. This "Equipment Replacement Analysis" form (as determined by the MAPI formula) helps you to take the guesswork out of this problem —to arrive at sound dollar and cents answers. Aids determining what and when to replace.

Gisholt has made up this form in a handy 4-page folder with step-by-step instructions on how to use it. Write for your free copies today.



UNDER-PAR EFFICIENCY...*REPLACE NOW!*

GISHOLT

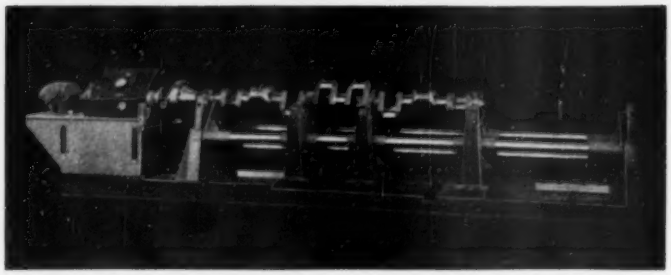
GISHOLT

COST CUTTING IDEAS

EVEN A 4800-LB. CRANKSHAFT CAN BE BALANCED WITH REAL ACCURACY

At Baldwin Locomotive Works, they know that, "If it rotates, it should be balanced." That's why the big crankshafts of the diesels which power Baldwin Locomotives are precision balanced before going into service.

A standard Dynetric Type 6-UH Balancing Machine, especially adapted for this work, is shown balancing a giant 8 throw, 4790-lb. diesel crankshaft. This one machine handles all of Baldwin's present—and future—crankshaft requirements. The machine balances these parts to such a degree of accuracy that the crankshaft will vibrate less than .0002". After unbalance is located and measured, correction is made by drilling out excess metal.



4790 lbs. of crankshaft which, after balancing, has an accuracy of one-pound-inch, or equivalent to a measurable displacement of .0002" at either end

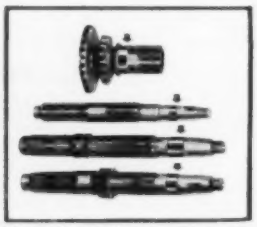
Such careful attention to quality is one reason these diesel-electric locomotives are constantly setting such high performance records.

DYNETRIC BALANCERS GISHOLT

Balancing is explained in a valuable 36-page booklet which is mailed free on request. Write on your letterhead

OIL SEALS REALLY SEAL—THANKS TO SUPERFINISH

Write today for your free copy of WEAR AND SURFACE FINISH—an 80-page textbook giving complete information on Superfinish.



Here are four of the wide assortment of parts this firm is Superfinishing. Arrows show surfaces which have been Superfinished. Largest part in this photo is 24" long. Machine handles parts up to 36".

Thirty-eight seconds after the operator starts the Superfinisher, the oil seal surface of this shaft is finished from 25-30 micro inches to 3 to 8 micro inches.

No more troubles of leaking oil seals for J. I. Case Company. Superfinish has ended them

Many different tractor shafts and sleeves are now Superfinished—at 38 seconds per part—on a standard Gisholt Model 52A General Purpose Cylindrical Superfinishing Machine.

In a previous (and very economical) grinding operation, surfaces are brought down to high limits of size and a finish of 25-30 micro inches. Then operator merely loads the Superfinisher and presses a button. The machine with its *automatic* cycle provides a finish of from 3 to 8 micro inches in just 38 seconds. Changeover to other parts takes but 10-15 minutes average.

Shaft sealing surfaces are now so smooth no break-in is necessary. Leakage is reduced, higher oil pressures can be used when needed. Because there is virtually no surface roughness, the fine finish lasts indefinitely.

No. 1250

GISHOLT

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

A general catalog on machines listed below is available on request.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

"no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Crucible Steel Company of America
Dept. A, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

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Company_____

Street_____

City_____ **State**_____

CRUCIBLE first name in special purpose steels

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fifty years of Fine *steelmaking*

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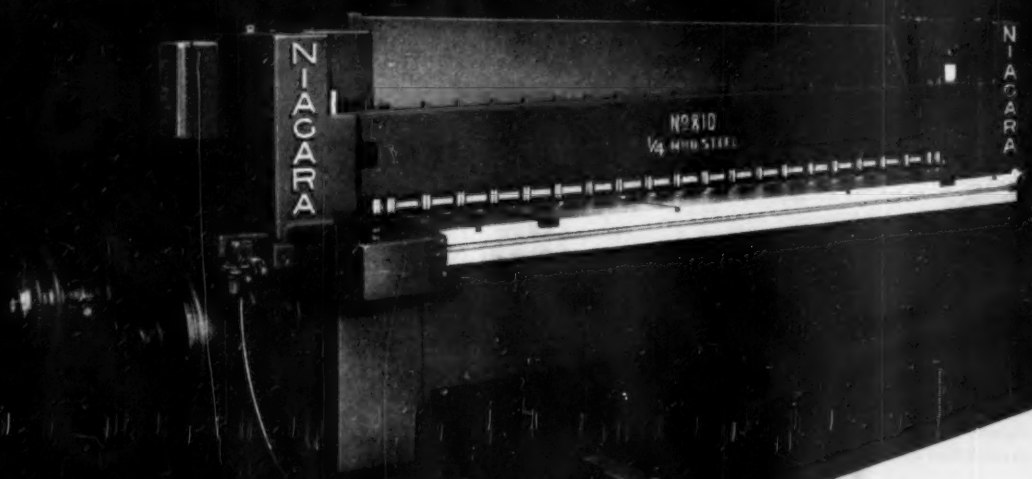
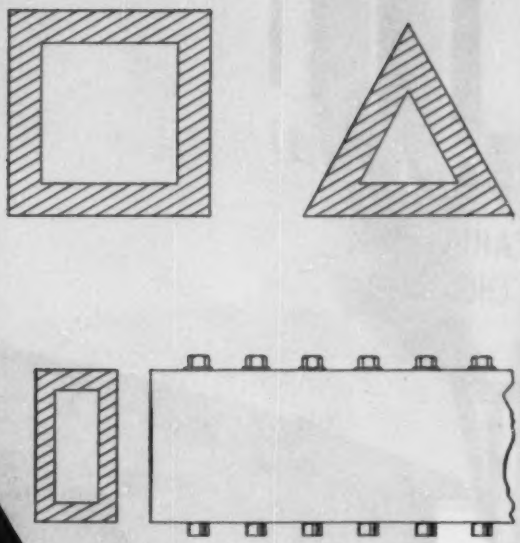
Accuracy in a squaring shear is dependent on rigidity of the shear's components and not upon any individual feature. Sturdiness, convenience, speed and dependability are the result of experienced engineering and superb manufacture.

Latest type Niagara No. 810 Power Squaring Shear. Arranged with electro pneumatic tripping device operated by foot switch.



BASIC SHEAR DESIGN Results in Accurate Cutting



● BED, CROSSHEAD, HOLDDOWN and HOUSINGS in NIAGARA UNDERDRIVE SHEARS are box sections to resist with minimum deflection the horizontal, vertical, diagonal or torsional stresses to which every shear is subjected. No other section will do the job as efficiently. This construction results in extreme strength and rigidity without resorting to deep beam sections which, in the bed, necessarily project below the floor line.

The simple, mechanically operated holddown having individual self compensating pressure feet, performs all required functions of a good holddown efficiently, effectively and quietly without using complex hydraulic circuits, pumps, valves, packings, cylinders, etc. and without generating heat. Maintenance costs are held to a minimum.

The drive is thru efficient spur gears mounted on anti-friction bearings and running in oil. It employs the famous Niagara 14 point instant engaging sleeve clutch. There are no sliding surfaces such as in worm gears and friction clutches to consume power, generate heat, and to wear rapidly.

NIAGARA MACHINE & TOOL WORKS · BUFFALO 11, N. Y.

Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT · CLEVELAND · NEW YORK

SUPER BALL BEARING

For Your Heavy Duty Drilling

The frictionless tightening permitted by its ball bearing construction gives this rugged chuck the world's tightest grip.

When drilling tough metals under heavy duty conditions, insist on Jacobs Super Chucks to eliminate tool slippage and to reduce drill breakage.

Jacobs Ball Bearing Super Chucks and Plain Bearing Chucks are stocked by your nearby Industrial Supply Distributor. The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

PLAIN BEARING

For Your Medium and Light Work

The most widely used drill chuck in the world today. Its rugged design and construction assuring precision performance over a long service life come from 47 years of experience in manufacture.

That's why makers of drill presses, pneumatic and electric portable tools insist on Jacobs Plain Bearing Chucks as original equipment.

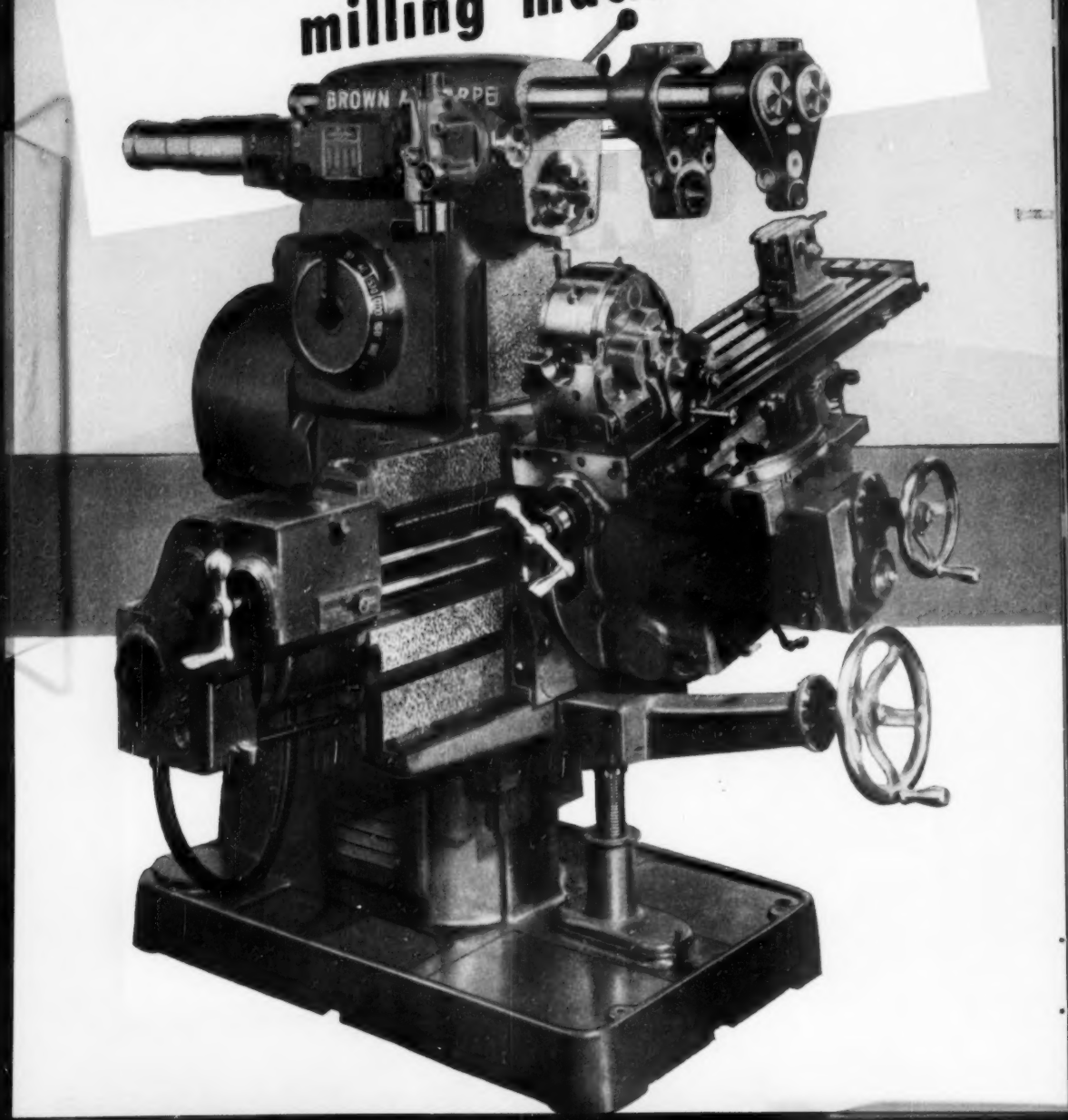
FOREMOST IN CHUCKS · FIRMEST IN GRIP

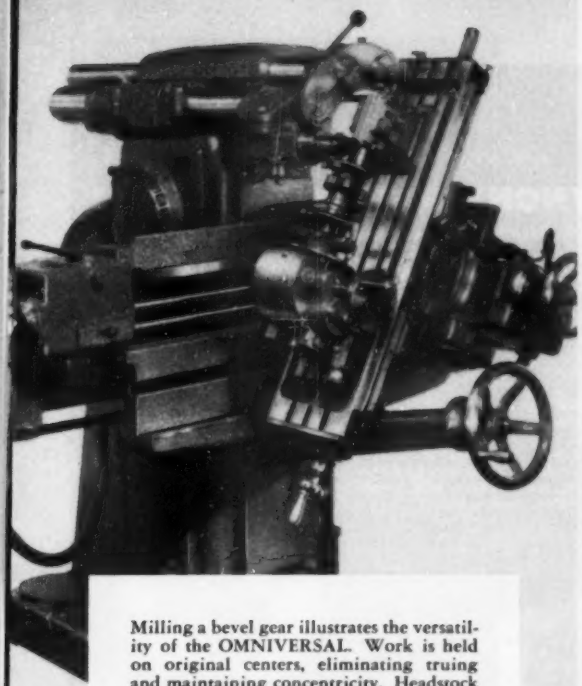
If it's a JACOBS, it holds

Jacobs Chucks

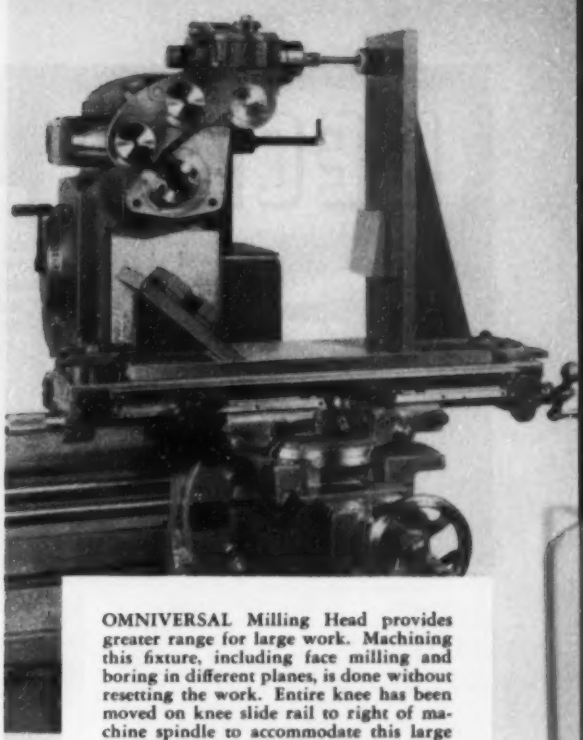
ANNOUNCING

The New OMNIVERSAL milling machine





Milling a bevel gear illustrates the versatility of the OMNIVERSAL. Work is held on original centers, eliminating truing and maintaining concentricity. Headstock and footstock provide greater support and save time. Knee is readily swiveled to 60° either side of horizontal. The vernier on knee reading to 2 minutes of arc assures greater accuracy.



OMNIVERSAL Milling Head provides greater range for large work. Machining this fixture, including face milling and boring in different planes, is done without resetting the work. Entire knee has been moved on knee slide rail to right of machine spindle to accommodate this large work piece. Milling Head can be used in three column positions further increasing the machine's versatility.

Brown & Sharpe

...the milling machine with unparalleled versatility!

This is it — the ultimate in milling machine versatility! The new Brown & Sharpe No. 0 Omniversal Milling Machine performs a wide variety of work without the need for attachments, jigs, or fixtures. Ideal for toolrooms, experimental and research laboratories, — also repair shops and small-quantity production plants.

For all normal milling operations and the unusual applications demanding highest precision, there is no substitute for the OMNIVERSAL. Ability to mill simple or compound angular surfaces or to drill and bore at angular settings permits complete machining without resetting work on table. Milling tapered work on Index Centers no longer requires swiveling head and footstock or special fixtures. Taper spirals are readily milled.

The result is greater accuracy with a saving in both set-up and machining time.

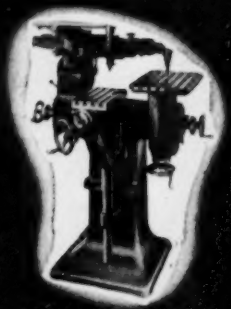
Get the complete story on this outstanding machine. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

DECKEL

SYNONYMOUS WITH QUALITY

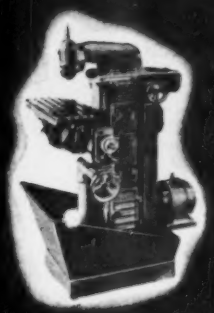
DECKEL MACHINE TOOLS universally recognized for Quality, Precise Production and Versatility. They can be used as single purpose machines for production or for multi-purpose operations in tool rooms and specialty plants.

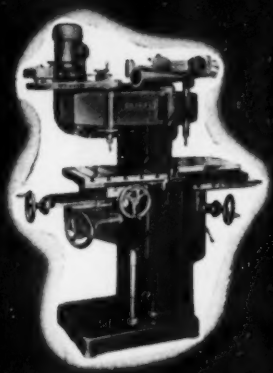
Investigate all the advantages of DECKEL Universal Machines — Quality Tools at Lower Costs. In Stock For Immediate Delivery.

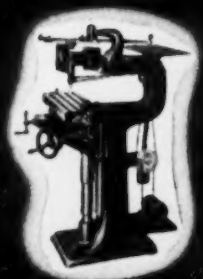


GK — 3 DIMENSIONAL ENGRAVER & COPY MILLER (2 Sizes) for fine engraving, embossing and copy-milling dies, molds, etc. up to 330 lbs. Reduction or enlargements from 1:1.5 to 1:10. Pre-loaded bearings in pantograph provide easy guidance, playless motion, minimize vibration. Larger machine has rough milling attachment.

FP 1 — UNIVERSAL MILLER (Horizontal and Vertical) for single jobs or production of tools, jigs, gauges, dies and molds. Micrometer measuring devices for jig boring. Attachments: Punch Milling, Spiral Milling, Vertical Milling Heads, Slotting Device, Fixed, Swivel or Circular Tables, Dividing Head.





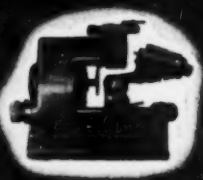


G 1 U — 2-DIMENSIONAL ENGRAVER for fine engraving and light milling. Ratios from 1:1 to 1:50. Light Pantograph with playless ball bearing joints provides easy guidance and accurate work.

KF 1 — UNIVERSAL COPY MILLER for producing dies and molds up to 1100 lbs. With special accessories, the KF 1 provides greatest manufacturing economy. One handed 3 dimensional control. Ratio 1:1. Reduction and enlargement attachment has ratio from 1:1.5 to 1:7. Copy Table — 15¾" sq. Max. work piece height 17". Optical tracing mechanism. Circular milling attachment.

S 1 — UNIVERSAL TOOL & CUTTER GRINDER for grinding spiral or straight fluted cutters, counterbores, countersinks, straight and taper reamers, taps, etc. Production grinding of high precision tools. Easy, convenient operation with utmost accuracy.

TYPE SON — SINGLE LIP CUTTER GRINDER indispensable for grinding and backing-off form cutters and tracing styluses used on the G 1 U, GK 12, GK 21, KF 1, FP 1. Can be operated quickly and accurately by unskilled workers.



SEE THESE MACHINES IN OPERATION AT COSA'S NEW YORK SHOW ROOM OR SEND FOR DESCRIPTIVE LITERATURE.

COSA CORPORATION
405 Lexington Ave., New York 17

NATIONAL REPRESENTATIVES FOR: REISHAUER—Gear & Thread Chaser Grinders—Lead Screw Lathes • BECHLER—Swiss Automatics—Cam Shapers • DECKEL—Engravers and Copy Millers • MICAFIL—Coil Winders • SALLAZ—Burnishing Machines • SCHUTZ—Forming and Cutting-Off Machines STUDER—Profile Grinders.

TRI CLAD MOTORS
REG. U.S. PAT. OFF.
will run safely without relubrication for as long as any general-purpose motor you can buy—
and if the application makes relubrication a must, you can grease a TRI CLAD without halting production
GENERAL ELECTRIC
HERE'S WHY

TRI CLAD MOTORS will run safely without relubrication for as long as any general-purpose motor you can buy—

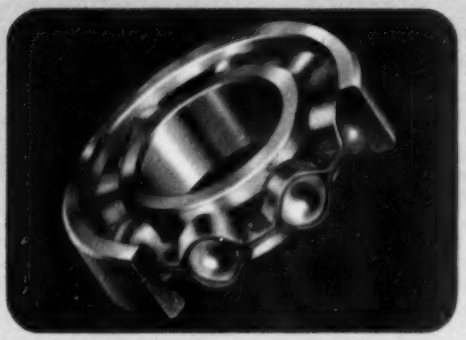
Tri-Clad extra lubrication "protection" can save you money because:

1. Tri-Clad's oversize grease reservoir and the heaviest standard-service bearings mean you do not have to bother with greasing between motor check-ups.

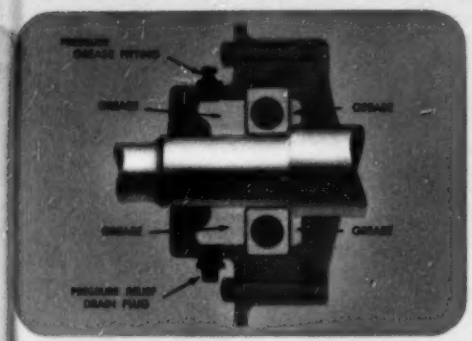
2. When relubrication is needed on those tough applications, you can grease a Tri-Clad without interrupting production-line operations.

Tri-Clads are grease-gun easy to lubricate *on the job*. Moreover, a Tri-Clad motor will run safely where an ordinary motor would fail. Chances are you'll be spared the cost of a "special" motor.

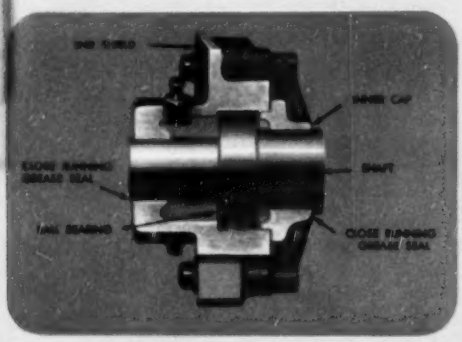
YOU BE THE JUDGE! The best way to prove to yourself that Tri-Clad gives you the most for your motor dollar is to contact your local G-E office. Tri-Clad stocks are complete. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



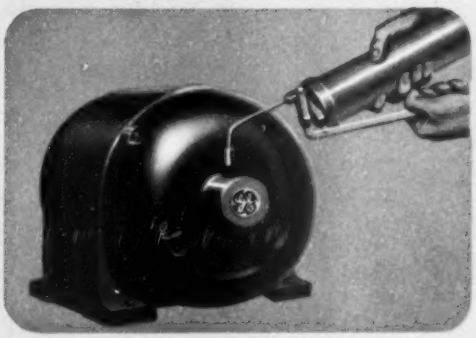
1 **EXTRA BEARING PROTECTION** — Tri-Clad gives you extra bearing protection because heaviest standard-service bearings are carefully selected to withstand severe loads for long periods.



2 **EXTRA GREASE** — Four times the ordinary amount of grease is packed into the large Tri-Clad grease reservoir. Since bearing life depends on grease, this means that Tri-Clad motors will run safely for years — far as long as any general-purpose motor you can buy.



3 **SEALED-IN BEARINGS** — Bearings and grease are completely sealed in a cast housing with long running seals for extra protection from dirt, dust, and lubricant leakage.



4 **PRESSURE-RELIEF GREASING** — An efficient system of pressure-relief lubrication (with standard fittings) enables a Tri-Clad motor to be quickly and easily greased on the job when and if it's needed.

GENERAL ELECTRIC

732-3

. . . and you, too, can do it faster, better and at less cost with a Standard Red Shield Drill. No matter what you have to drill—iron, steel, brass, copper, aluminum, plastic—we have a Shield Brand Drill especially made for the job.

Shield Brand Drills—like all the Shield Brand Tools—are Foremost Quality in design, construction, workmanship. Our Service Men have the benefit of over 69 years' accumulated experience in solving tough drilling, reaming and metal cutting problems. Their advice and suggestions are gladly given *without cost or obligation.* Leading Industrial Supply Distributors coast to coast will look after your requirements for Standard Shield Brand Tools.

STANDARD TOOL CO. CLEVELAND 4, OHIO

STANDARD TOOL CO.

New York • Detroit • Chicago • San Francisco

THE STANDARD LINE: ***Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools***

This is another of the "HUNDREDS OF JOBS" which can be done on a MARVEL Band Saw!

MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the $64 question—how to machine out the 1½" slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of 6½".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model #8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of $3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

WRITE FOR CATALOG

MARVEL *Metal Cutting* **SAWS**
Better Machines—Better Blades

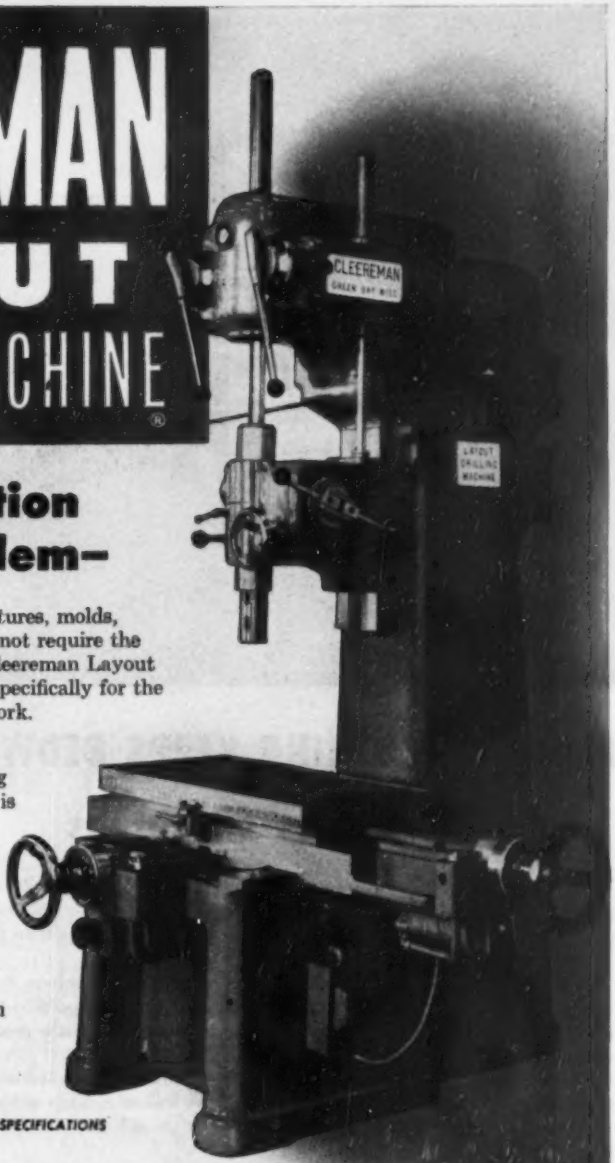
These exclusive MARVEL Features made this job easy.

1. Large, T-slotted work table.
2. Blade feeds into work vertically; work always stationary.
3. Power-pressure feed.
4. Automatic Blade tension.
5. Built-in coolant system.
6. Large capacity.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

CLEEREMAN LAYOUT DRILLING MACHINE®



A Modern solution to an Old Problem–

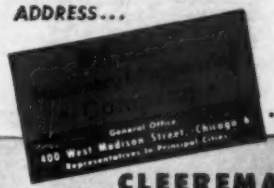
A large portion of tools, dies, jigs, fixtures, molds, jig-less production and other jobs do not require the ultra-precision of a Jig Borer. The Cleereman Layout Drilling Machine has been designed specifically for the efficient handling of this particular work.

Built with many features of design similar to those used in Cleereman Jig Borers, the Layout Drilling Machine is an economical machine capable of accurately locating, drilling, boring, reaming, tapping, etc., with the utmost of operator ease, at a fast rate of production over a long period of time.

Cleereman standards of high quality and proven engineering design and material selection have been maintained in every detail.

WIRE OR WRITE FOR CATALOG WITH COMPLETE SPECIFICATIONS

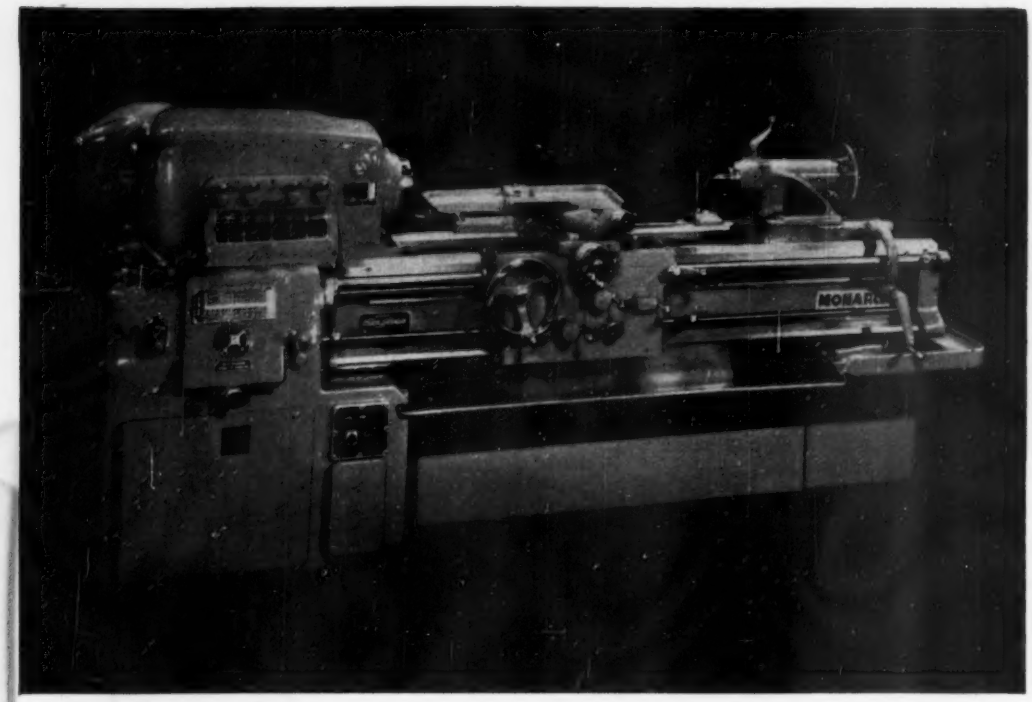
ADDRESS...



... Affiliated with ..

CLEEREMAN MACHINE TOOL CO. Green Bay, Wisconsin

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES



FLAME-HARDENING KEEPS BEDWAYS FACTORY-FRESH

—on Series 60 Lathes

The famous Flame-Hardened and Ground Bedway is an exclusive process, pioneered by Monarch. This important construction feature, proved in use on both the carriage and tailstock bedways of more than 25,000 Monarch Lathes, is standard for all Series 60 machines.

As indicated by the accompanying illustration of a typical bedway section, this process results in a surface with the uniform hardness properties of steel, integral with the softer bed metal. The result is longer life and the preservation of original in-built accuracy.

This same principle of insuring factory-fresh precision is evidenced in every moving part of the Series 60 machines. All gears and other parts subject to wear are made of steel; then hardened by the best possible method, including induction hardening.

These and many other design and construction advantages found in Series 60 lathes mean longer life and more savings through lowered operating and maintenance expense. For complete information on these outstanding machines, available in 14″, 16″ and 20″ sizes, ask for Booklet 1113.

Section of Monarch Flame-Hardened Bedway

You'll Save on Maintenance and Operating Expense With These Series 60 Features:

1. Totally-enclosed gearbox and end gearing—preserves accuracy.
2. Automatic pressure lubrication—insures long life at original efficiency.
3. All anti-friction bearings—for peak power and less maintenance.
4. Hardened, ground or shaved, wide helical gears in headstock—for precision power, easier shifting.
5. American Standard Camlock Spindle Nose—for quick, rigid chuck and fixture mounting.
6. Flame-Hardened and Ground Bedways—preserves accuracy—proved on over 25,000 Monarch Lathes.
7. Induction hardening of many critical parts—for long, trouble-free life.

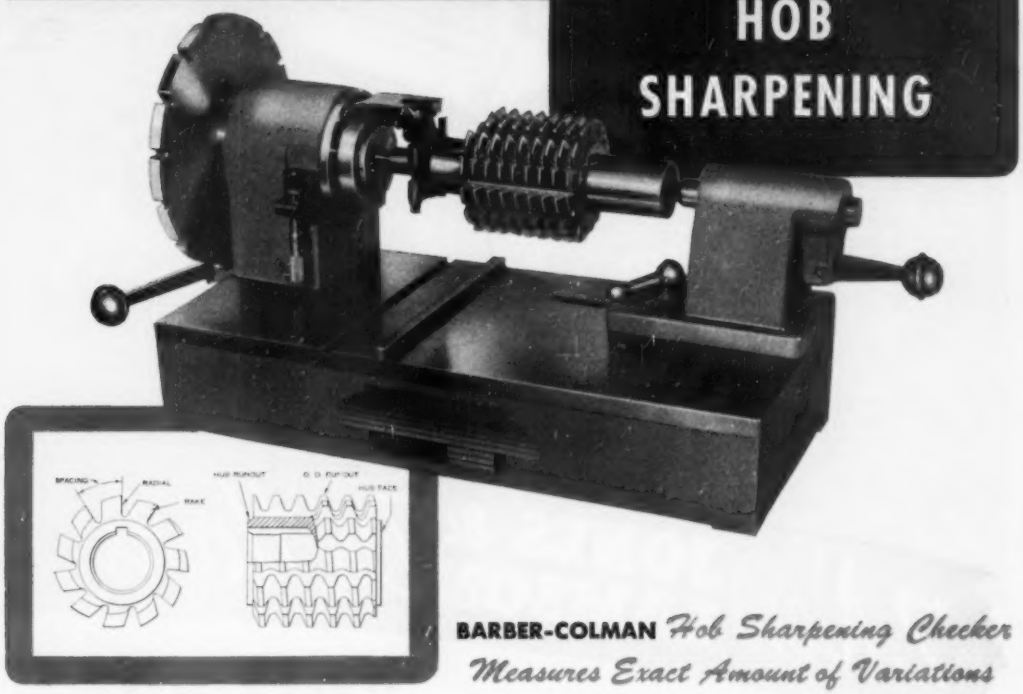
ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

TAKE THE *Guesswork* OUT OF

CHECKING HOB SHARPENING



BARBER-COLMAN *Hob Sharpening Checker*
Measures Exact Amount of Variations

● Conventional methods for checking hob tooth face and spacing indicate whether these elements are correct but, in case of errors, they are unable to show how much error exists.

The new Barber-Colman Hob Sharpening Checker eliminates guesswork by measuring the exact amount of variation in radial faces, flute spacing, face offset and accuracy of straight flutes with the axis of hobs.

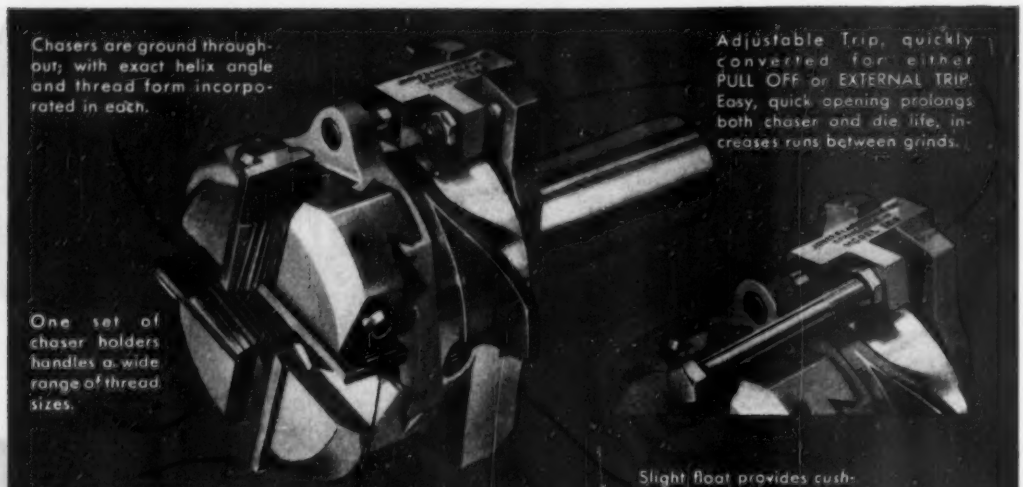
Standard 9-1/2″ diameter index plates, held within ±.0005″ adjacent and ±.0015″ non-adjacent spaces, are used to position hob tooth faces for indicating relative to a micrometer gage block. Extra-precision index plates, ±.00025″ adjacent and ±.001″ non-adjacent spaces may also be ordered. Because of the greater size of the index plate, absolute precision checking is assured at standard hob diameters.

An alignment bar in the surface plate base provides a locating point for checking helical fluted tools. Besides providing a precision check on face elements, the Checker is also used for checking runout of hub face and diameter, and O.D. runout of hobs and cutters.

Send for additional information and specifications on this new method of checking hob sharpening accuracy. Write Dept. A.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 6138 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.


Chasers are ground throughout; with exact helix angle and thread form incorporated in each.
Adjustable Trip, quickly converted for either PULL OFF or EXTERNAL TRIP. Easy, quick opening prolongs both chaser and die life, increases runs between grinds.
One set of chaser holders handles a wide range of thread sizes.
Leading edge of chasers extends beyond face to permit threading close to shoulders.
Chasers can be changed and set quickly, easily and accurately. A few turns of a single screw will release or secure each chaser in its holder.
Slight float provides cushion start, helps prolong chaser life.

2 New JONES & LAMSON Die Heads

No. 18 and No. 19

for No. 0 and No. 2 Brown & Sharpe Automatics

★ Simple, compact design combines light weight with rigidity, to function dependably and accurately at high indexing speeds, with long runs between grinds.

★ All important bearing surfaces are hardened and ground and hand lapped.

★ All external surfaces are chrome plated for protection.

Designed and built for high production quality threading, economy and durability, these die heads are made to standards of accuracy and finish comparable to the finest products of the toolmaker's art. They perform with smooth, easy action, repetitive accuracy and year-round dependability, at low operating cost.

HARDENED AND GROUND CHASERS

Jones & Lamson tangent chasers are made from finest quality high speed steel which must first pass rigid metallurgical tests in our plant. Specialized, experience-tested hardening operations in our modern heat treating department assure a uniform product which incorporates a maximum degree of toughness and wear resistance.

All chasers are ground throughout, with the exact helix angle and thread form incorporated in each.

Carbide chasers can be supplied if all conditions permit.

Thread Tool Division

Write to Dept. 7107 for your copy of our new Tangent Die Catalog.

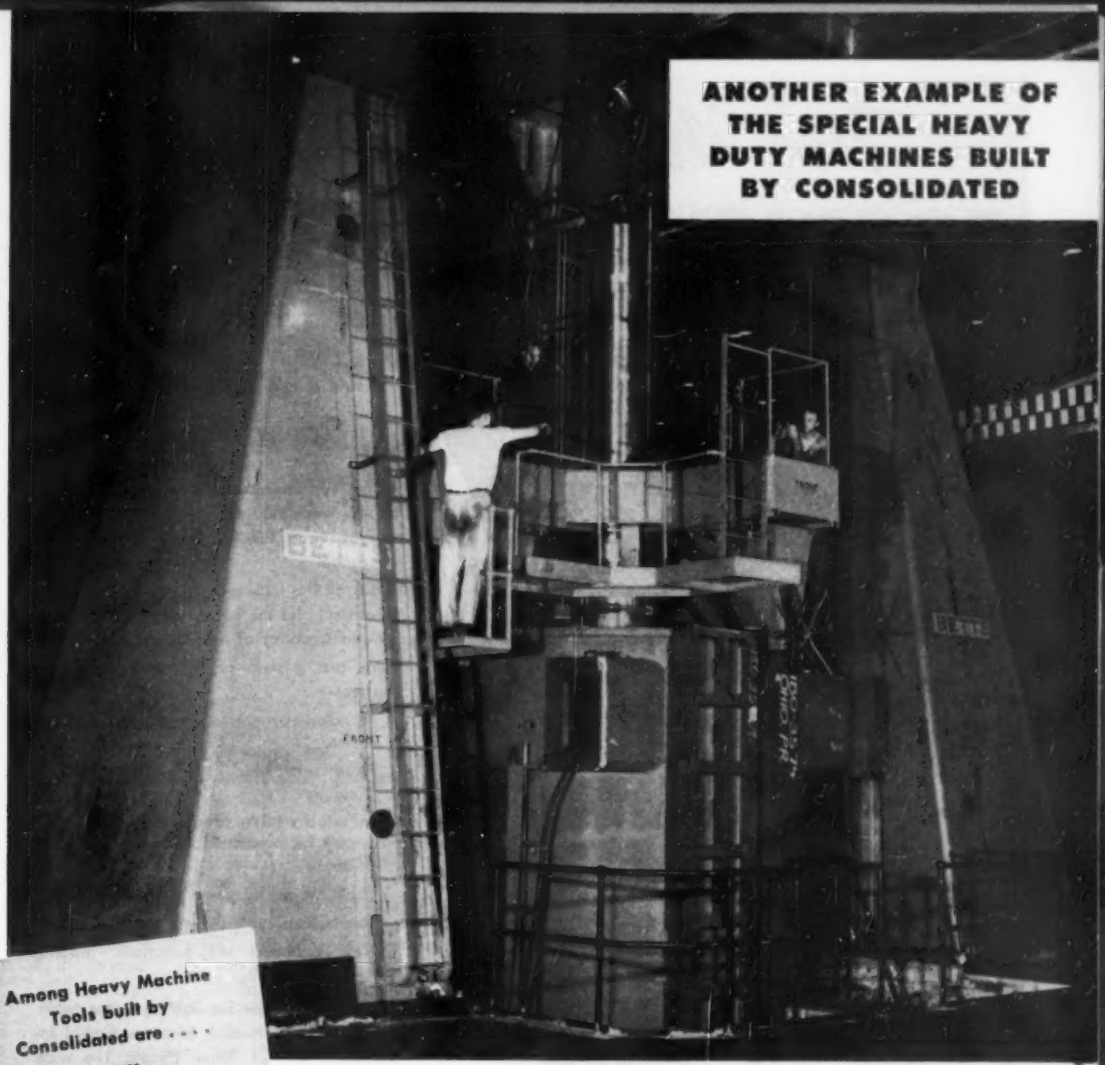
JONES & LAMSON

MACHINE COMPANY

Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

ANOTHER EXAMPLE OF THE SPECIAL HEAVY DUTY MACHINES BUILT BY CONSOLIDATED



BETTS SPECIAL VERTICAL BORING AND FACING MACHINE

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS AND OTHER SPECIAL MACHINES

Built for one of the larger electrical companies and used for boring and facing heavy welded steel generator stator frames from a vertical position, this unusual machine eliminates the inaccuracies heretofore present in such operation performed horizontally and, at the same time, reduces boring time by approximately two-thirds. It may also be used for drilling rib sections and milling spring assemblies. This machine is 36'-6" high, 13'-0" of which is below the floor level. Weight approximately 190,000 pounds. The boring bar is 22" in diameter and 36'-0" long.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

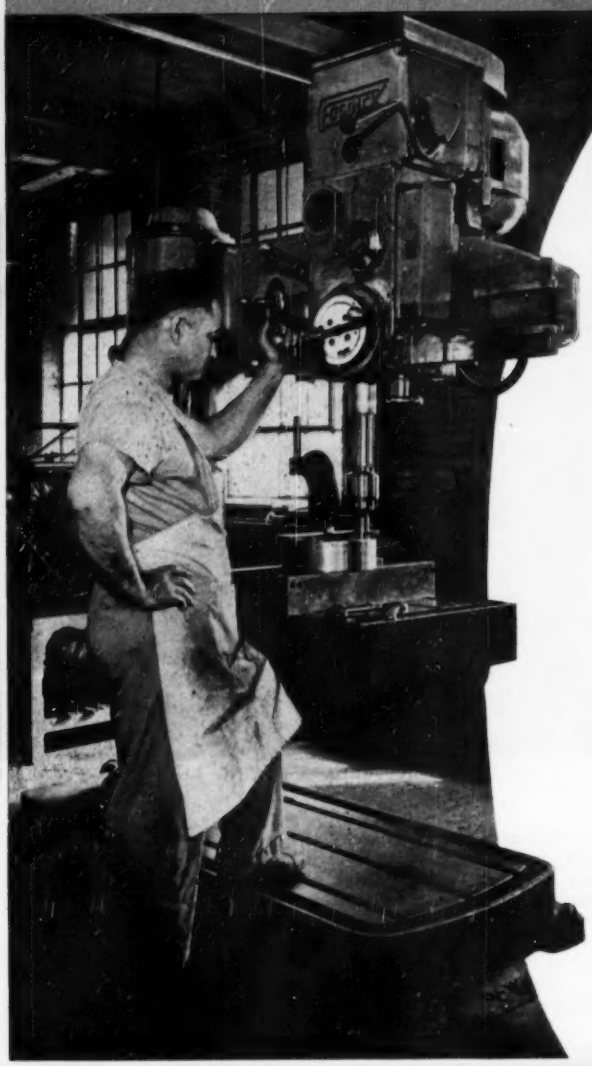
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Two Machines in One!

FOSDICK SENSITIVE RADIAL



It's a Sensitive It's a Radial

● To fully appreciate the wide application of this versatile machine you should see one of these Fosdick Sensitive Radials in operation.

It has all the high speed features of a Sensitive Drill plus the heavy construction, rigidity and flexibility of a Radial.

Here are a few of its many advanced features—

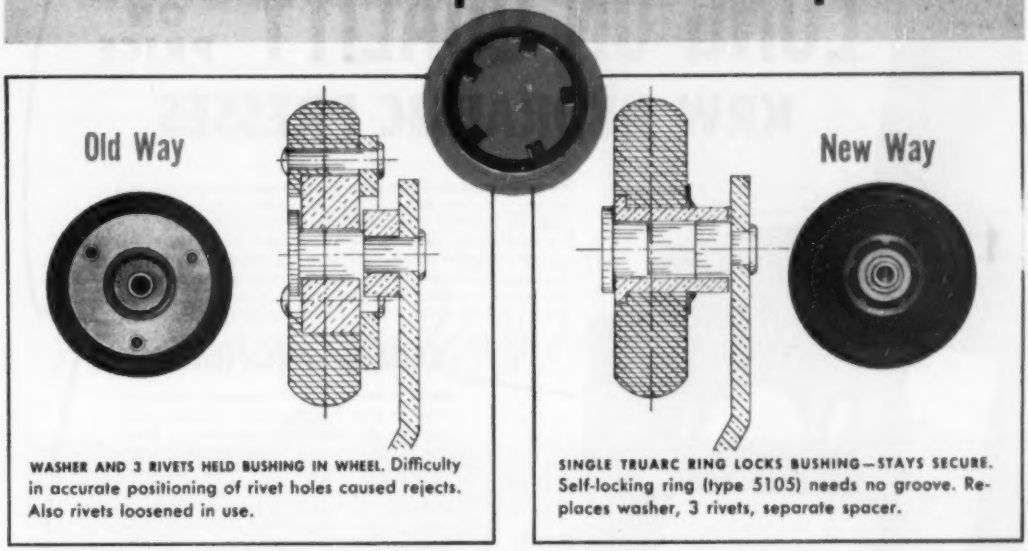
- 12" diameter one piece column construction.
- Fixed arm which swings 360° around column.
- Adjustable table which swings 360° and may be positioned to suit any drilling job.
- Table moved by power or hand.
- Tool ejector.
- New patented semi-automatic tapping control.
- Fluorescent tube for lighting entire table.

Illustrated is a Fosdick Sensitive Radial installation at East Alton, Illinois. The wide acceptance of this highly versatile machine tool is largely the result of its adaptability to such a large number of drilling operations in so many different kinds of work pieces. If you want to cash in on the savings offered in this moderately priced all purpose sensitive radial, put one to work in your shop.

For specific details as to design construction and application, write for the Fosdick Sensitive Radial Bulletin S. R. A.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

Single Truarc Ring Slashes Unit Cost 44% ...eliminates 3 operations and 5 parts



WASHER AND 3 RIVETS HELD BUSHING IN WHEEL. Difficulty in accurate positioning of rivet holes caused rejects. Also rivets loosened in use.

SINGLE TRUARC RING LOCKS BUSHING—STAYS SECURE. Self-locking ring (type 5105) needs no groove. Replaces washer, 3 rivets, separate spacer.

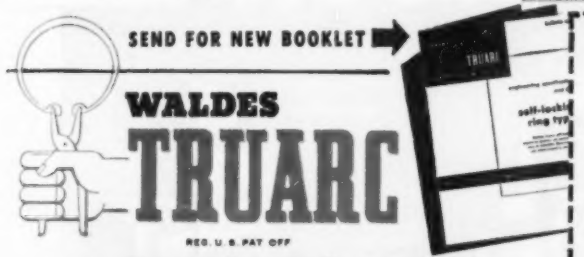
Redesign with one Waldes Truarc Ring cuts cost of wheel used in Har-Vey Rolling Door Hardware (for residential doors) from 26.1¢ to 14.5¢—a 44% saving for Metal Products Corporation, Miami. Use of Truarc cuts manufacturing time 76%. Eliminates 5 separate parts, 3 press operations. And gives a product that stands up better in use!

Redesign with Truarc Rings and you too will cut costs. Wherever you use machined shoulders, bolts, screws, nuts, cotter pins, snap rings, there's a Truarc Ring that does a better job of holding parts together. Truarc Rings are precision engineered. They make assembly and disassembly quick and easy.

See what Truarc Rings can do toward cutting overall costs for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

Redesign with Truarc self-locking ring produces these savings:

	saving
eliminates drilling 3 rivet holes	$.0042
eliminates riveting washer	.0111
eliminates punching washer	.00033
eliminates washer, spacer, rivets	.02236
cuts cost of inserting bushing	.00037
cuts cost of inspection	.0032
cuts cost of wheel, bushing, rivet	.0797
	.12126
less—cost of Truarc Ring	.00528
TOTAL SAVING PER UNIT 44%	$.11598



SEND FOR NEW BOOKLET

WALDES TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,382,948; 2,416,852; 2,420,921; 2,421,765 AND OTHER PATS. PEND.

AM 122

Waldes Kohinoor, Inc., 47-16 Austel Place
Long Island City 1, N. Y.

Please send Data Book on Waldes Truarc Self-Locking Ring Types.

Name_____

Title_____

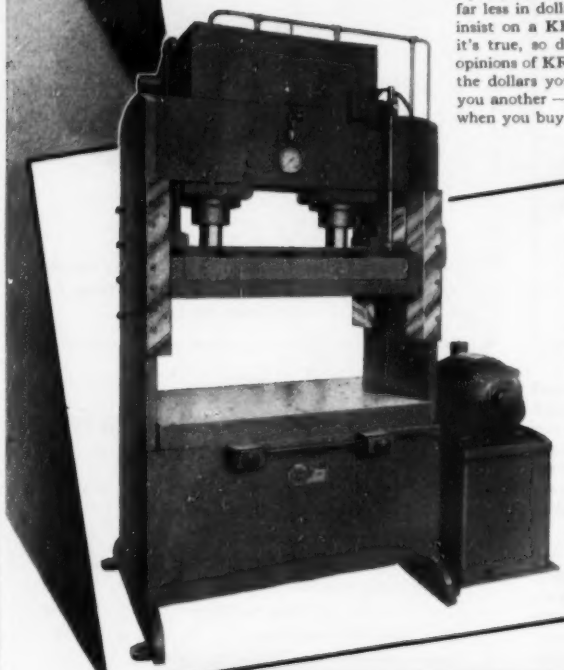
Company_____

Business Address_____

City_____ Zone_____ State_____

LONG ON QUALITY SHORT ON PRICE

KRW HYDRAULIC PRESSES



By any standard of comparison, the proven fact is: you pay far less in dollars and get far more in performance when you insist on a KRW Hydraulic Press. The specifications prove it's true, so do performance records, and so do the expert opinions of KRW owners. The price tag tells you one thing — the dollars you save. The unexcelled quality standards tell you another — the dollars you'll make! You should get both when you buy! Write or wire for the full facts and prices!

BRIEFED SPECIFICATIONS

KRW presses are self-contained and fabricated of steel for maximum strength, minimum weight, and space conservation. Precision honed cylinders. Adjustable limit switch for top return position of ram. Adjustable tonnage pressure control. Safety by-pass prevents over-loading beyond maximum rated capacity. Large self-contained oil reservoir. Direct connected motor drive to pumps through easily serviced flexible couplings. Safety controls prevent accidents. Long bronze faced gibs adjustable for wear insure accurate travel of slide. Quiet and vibrationless in operation. Presses can be custom built to meet your manufacturing requirements.

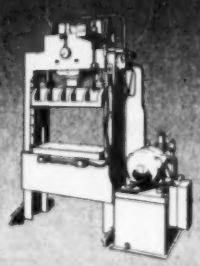
TWO CYLINDER TYPE Tons capacity: 60, 85, 100. Platen and bolster, maximum usable size: F to B, R to L, 36" x 60". Stroke: 6", 11". Bed, fixed. Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.

Write or wire for the full facts and prices.

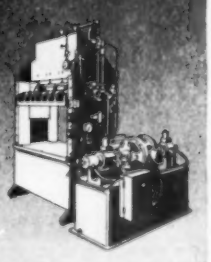
K. R. WILSON
215 MAIN STREET
BUFFALO 3, N. Y.
Dept. 11

K·R·WILSON

ONE CYLINDER TYPE Tons capacity: 25, 50, 75, 100, 125, 150. Platen and bolster, maximum usable size: 24", F to B, 36" R to L. Stroke: 6", 11", 18". Bed adjustment: increments of 6". Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.



THREE CYLINDER TYPE Tons capacity: 75, 100, 125, 150. Platen and bolster, maximum usable size: F to B, R to L, 45" x 72". Stroke: 6", 11". Bed, fixed. Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.



Butterfield Announces the Newest. . .

STUB FLUTE PRODUCTION TAPS. Especially designed for threading holes in thin sections, where depth of thread required is no more than the tap's diameter. Available in High Speed Commercial Ground fractional sizes (left) and machine screw sizes (right), these rugged, hard-hitting production taps are made to standard dimensions of spiral pointed taps, except for the short stub flute that provides extra strength.

in a famous line that includes. . .

SPIRAL FLUTE TAPS. Right hand cut, right hand spiral flutes with the correct degree of spiral allowing tap to cut freely while ejecting chips from hole. This design causes chips to spiral up and out of blind holes that have little or no chip room at the bottom.

PIPE TAPS. Straight or taper in high speed and carbon steel. High Speed Ground or Cut Thread taps available in regular or interrupted thread. Two distinct styles — one for steel and similar materials; another for cast iron and other such materials.

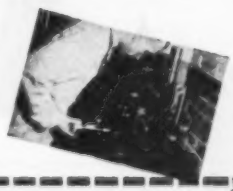
STANDARD HAND TAPS. Fractional and machine screw sizes, in high speed or carbon steel, are available in various styles — Taper, Plug, Bottoming and Spiral Point. High speed taps furnished in Commercial Ground, Precision Ground or Cut Thread.

and. . .

Stove Bolt Taps · Pulley Taps
Staybolt Taps · Boiler Taps
Nut Taps · Serial Taps · Tapper Taps
Mud or Washout Taps

All *Individually* Inspected . . . All Promptly Available From Your Nearby Butterfield Distributor

Checking pitch diameter, thread form and lead on a Zeiss Universal Measuring Microscope.



Union Twist Drill Company
BUTTERFIELD DIVISION
Derby Line, Vermont
In Canada: Rock Island, Quebec

BUTTERFIELD
THE 100% INSPECTED TOOLS
Every Tool Individually Inspected
TAPS • DIES • REAMERS • SCREW PLATES

25% MORE HOLES PER GRIND!

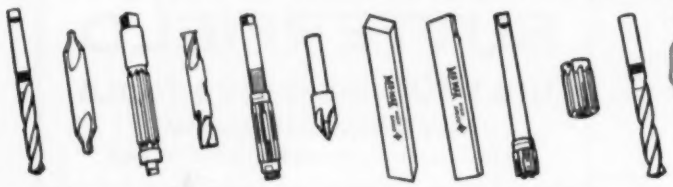
This CLE-FORGE High Speed Drill solved a tough problem!

This job was really rough. Each of the eight drills had to make two holes, and each surface was at an angle. The drills were averaging 1470 holes per grind, with considerable breakage. ◈ A *Cleveland* Service Representative was called in to analyze the problem. He recommended switching to the CLE-FORGE High Speed Drill shown at the left—a regular stock drill that has a heavier web. After an exhaustive test it was found that CLE-FORGE High Speed Drills averaged 1838 holes per grind! Breakage was practically eliminated! ◈ Let a *Cleveland* Service Representative show how *you* can get MORE HOLES PER DOLLAR. Contact our nearest Stockroom, or . . .

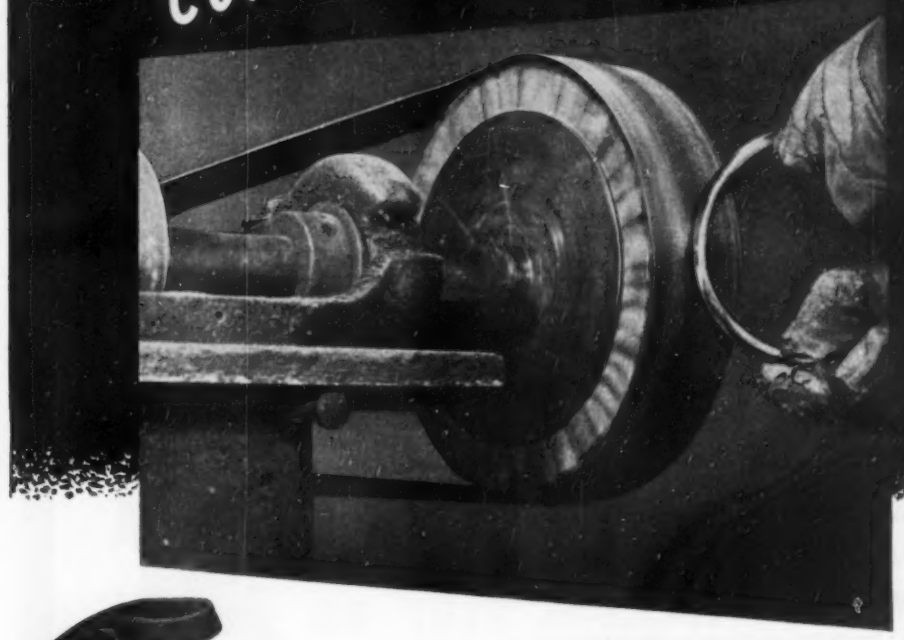
Telephone Your Industrial Supply Distributor

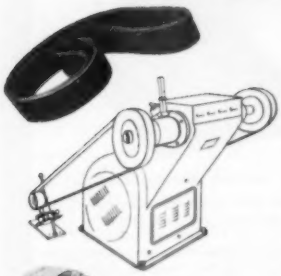
THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 2, England

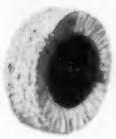
ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

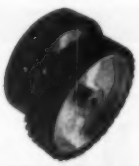


EXTREME CONTOURS... are *easy to finish* the Behr-Manning way!





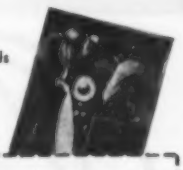




Contours get a fast, low-cost superior finish with a BEHR-MANNING engineered installation on the job. The properly cushioned surface of a BEHR-MANNING Coated Abrasive Belt, teamed with the right contact wheel and backstand, cuts cool and evenly, leaving the surface free of blending marks, wheel marks, scratches or holidays. Your production rate can be stepped up. Without interrupting your working schedule, our engineers will demonstrate in your plant or in a nearby Methods and Equipment Demonstration Room. Write us about it today.

YOU'LL WANT THIS NEW BULLETIN . . .

Just off the press. It tells the whole story of BEHR-MANNING Methods and Equipment Demonstration Rooms. Mail the coupon for your free copy today.



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TROY, N. Y.

Use NORTON *abrasives* sharpening stones

BEHR-MANNING, Troy, N. Y., Dept. S-9

Please send me a copy of your "Proving Ground for Production."

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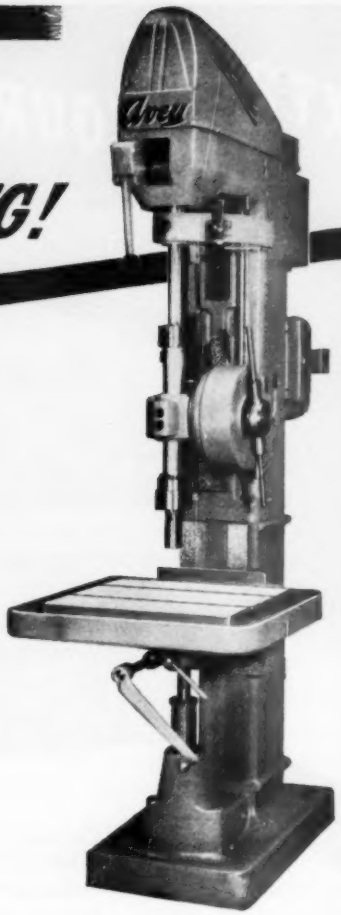
Tops in...
PRODUCTION*EERING!*



All over the world, Avey Sensitive and Upright Drilling and Tapping Machines are setting new records for cost cutting and production boosting. Avey's records speak for themselves . . . and men-in-the-know are listening!

Whatever your production problem, Avey's Sensitive and Upright Drilling and Tapping Machines—whether Standard Models or of Special Design—will solve that problem for you . . . *efficiently and economically!* You can't buy better machines . . . for less!

YOUR DRILLING AND TAPPING PROBLEMS GET IMMEDIATE ATTENTION FROM AVEY'S EXPERIENCED SALES ENGINEERING STAFF!

#3 AVEY BMA-6

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Avey DRILLING MACHINES

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Deep Hole Drilling Machines — Drilling and Tapping Units
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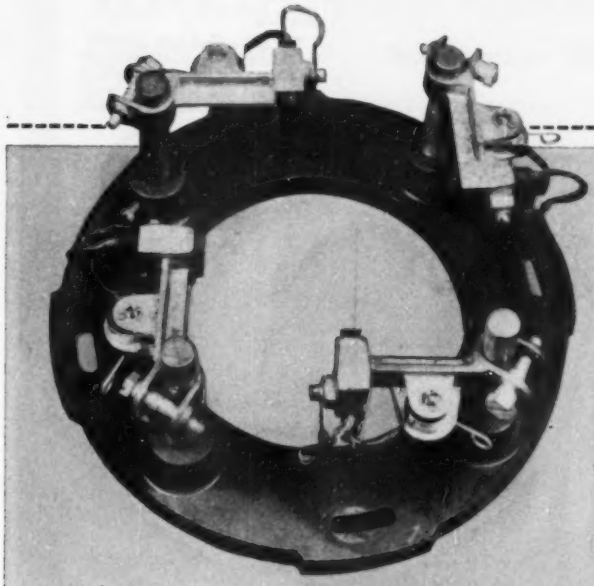
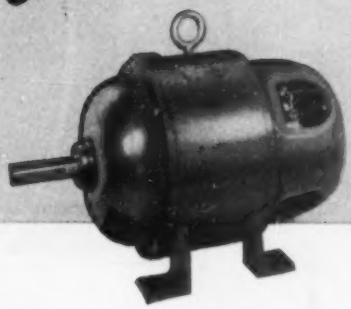
YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Something ***NEW*** *has been added to...*

SK DEPENDABILITY



Arcs leave no tracks on this *MELAMINE* ring

When conducting dust collects across the surface of a rocker ring, it can cause a flashover. In the case of ordinary materials used for rings, this arc carbonizes a path into the ring itself. Thus, when the machine is cleaned to remove conductive particles, the path or track cannot be removed. High resistance grounds result. Motor efficiency is lost.

But, carbon flashovers don't have a chance on this Melamine ring. It's arc proof... noncarbonizing. There is no tracking effect ... no "burned-in" paths to cause shorts. Thus, when you wipe the ring clean, it is restored to full service condition. Top motor efficiency is maintained.

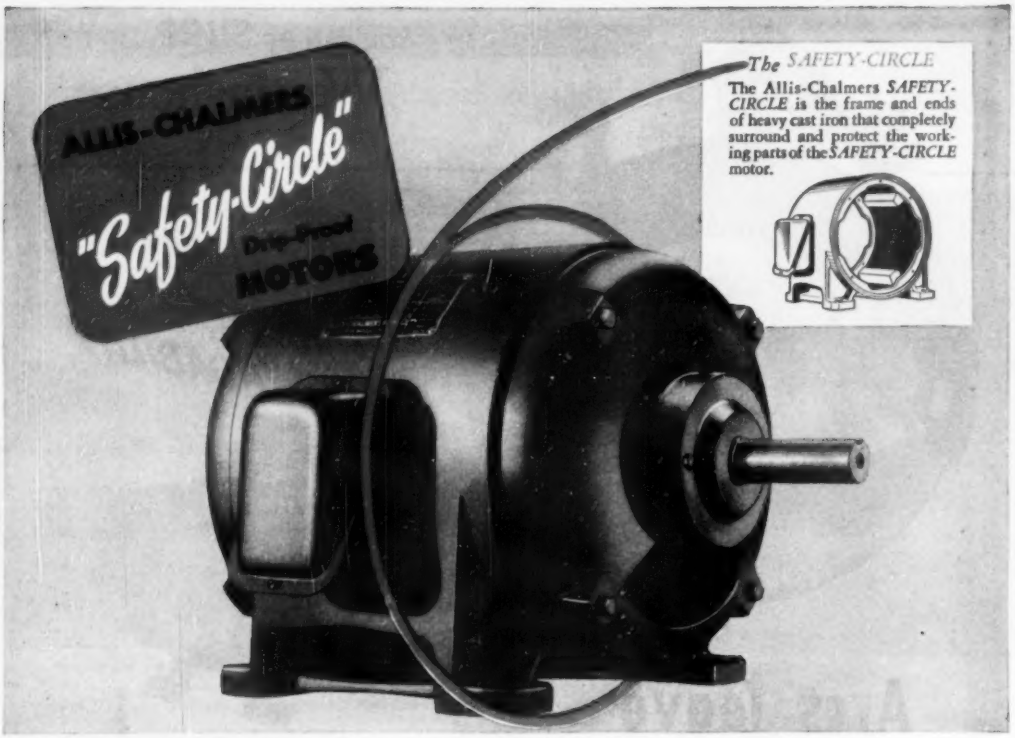
That is one reason why the Life-Line SK offers users of d-c motors new dependability. Cast brass brushholders are another. They are noncorroding ... have no bearings to wear or bind. No moving parts to get out of adjustment. A stainless steel spring maintains perfect brush contact through constant tension.

There are other reasons, too. Ask your Westinghouse representative to show you the inside story of the Life-Line SK motor. See the "Transvision" presentation. It takes the SK apart and puts it together again at your own desk. You'll see why something new has been added to SK dependability. Call your local representative today. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-21555

Westinghouse

Life-Line

D-C Motors


ALLIS-CHALMERS
"Safety-Circle"
Drip-Proof
MOTORS
The SAFETY-CIRCLE
The Allis-Chalmers SAFETY-CIRCLE is the frame and ends of heavy cast iron that completely surround and protect the working parts of the SAFETY-CIRCLE motor.

SAFETY-CIRCLE means

★ All-Around Protection ★ Low Maintenance ★ Dependable Performance

THE *SAFETY-CIRCLE* MOTOR is protected all around against those four great motor killers — corrosion . . . distortion . . . friction . . . foreign matter. The frame is of cast iron, the most corrosion-resistant material for this purpose.

The strength and stiffness of the cast iron is supplemented by ribbing and bracing to maintain alignment and prevent distortion. Ball bearings are lubricated and sealed at the factory. They require no attention for years. End brackets are drip-proof at no premium.

SAFETY-CIRCLE motors are fully protected inside, too. Multiple-dipped and multiple-baked stator plus extra inter-phase insulation provide extra protection against electrical breakdown.

With *SAFETY-CIRCLE* protection outside and protected working parts inside, you can count on years of trouble-free, low cost power.

For complete details on *SAFETY-CIRCLE* advantages, see your A-C Authorized Dealer or Sales Office or write for Bulletin 51B6210B. Stocked in sizes 1 to 20 hp. *SAFETY-CIRCLE*, *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

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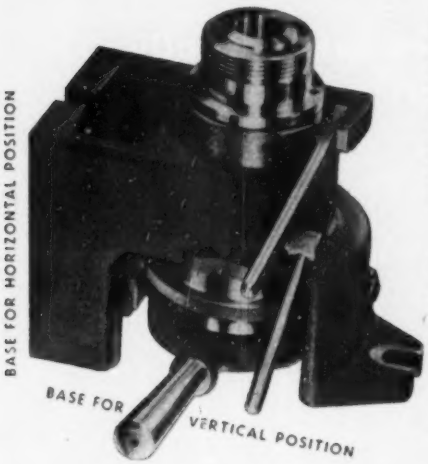
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

HARDINGE HORIZONTAL - VERTICAL

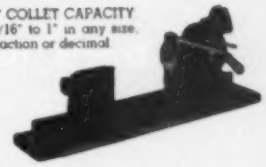
Collet Index Fixtures with Threaded Nose Spindle are fast in operation and hold work accurately



In addition to taking standard collets, this fixture takes step chucks and jaw chucks to cover a wide range of applications. It will eliminate the necessity of your tool room making many specially designed fixtures. Thus, your engineers and tool-makers will have more time for other work.

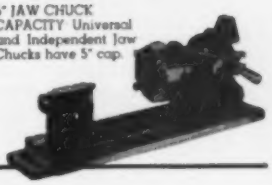
A preselector arrangement provides the selection of separate indexing of any number divisible into 20 or 24. The collet closer lever has a 100 to 1 leverage for quick opening and closing of collets and step chucks. Write for bulletin.

1" COLLET CAPACITY 1/16" to 1" in any size, fraction or decimal



6" STEP CHUCK CAPACITY 2", 3", 4", 5", and 6" Step Chucks and Closers are used.

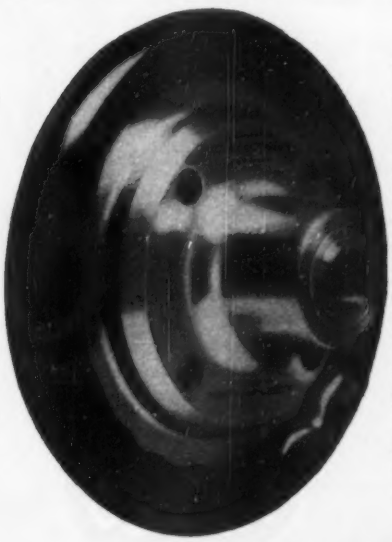
5" JAW CHUCK CAPACITY Universal and Independent Jaw Chucks have 5" cap.



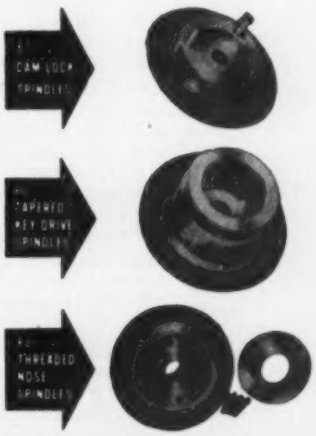
HARDINGE
ELMIRA, N.Y.

HARDINGE-SJOGREN SPEED COLLET CHUCKS

increase production of your lathes and milling machines



A Hardinge-Sjogren Nose Type Speed Collet Chuck enables you to get full value from your toolroom lathes, engine lathes and milling machines. It gives greater capacity, saves time, increases accuracy and assures better results. An almost effortless turn of the handwheel, one way or the other, automatically opens or closes the collet, releasing or gripping the work as desired. Its grip is adjustable and sure. Production is increased as the operator is always in front of his work. Available in these sizes . . . 1", 1⅜", 1¾", 2¼", or 3½" collet capacity. Write for bulletin.

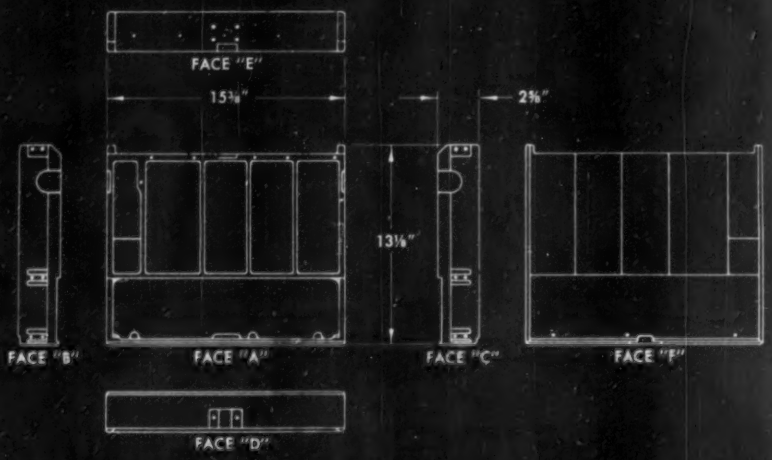


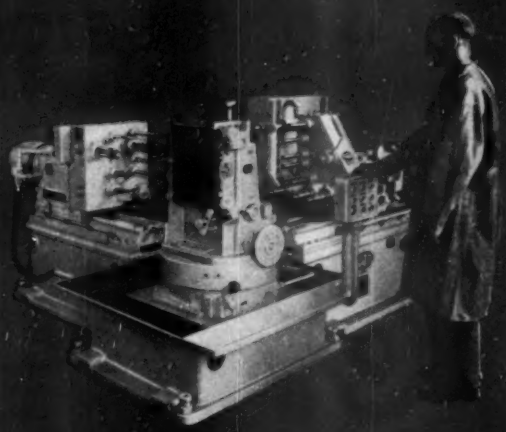
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

NATCO High-Speed Sensitive 2-way Driller

machines holes from .098 to .199 in plastic cash register drawers

Drills 1600 holes in 6 faces automatically to complete 50 drawers per hour





Send us your drilling, boring, tapping or facing problems . . . our engineers have the solution. Also be sure to ask for NATCO "Success Story" No. 5.

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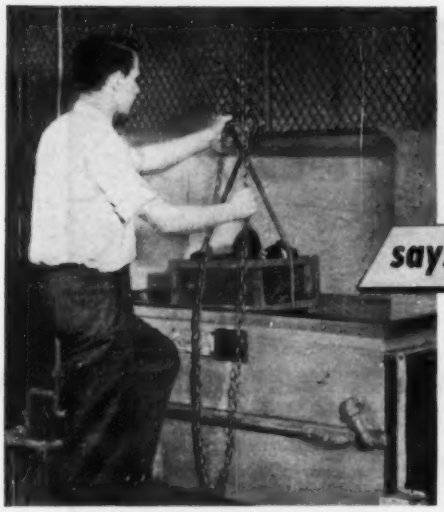


Hydraulic equipment parts are thoroughly cleaned in this manually operated vapor degreasing unit.

"Vapor Degreasing KEEPS OUR HIGH-SPEED PRODUCTION LINE RUNNING SMOOTHLY,"

says prominent Detroit manufacturer.

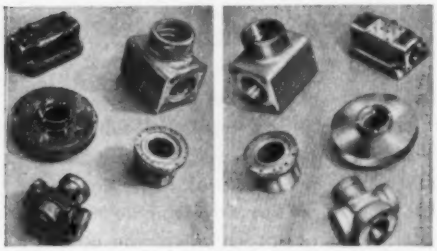
"From 10 to 30 tons of intricate machined parts are cleaned daily."

"We put in our first vapor degreaser 17 years ago and since that time have never used any other cleaning method," says the maintenance foreman of this manufacturer of hydraulic equipment.

"Today we have six vapor degreasers. We find they are just what we need to get quick, thorough removal of cutting and cooling oils, grease, rust, tapping compounds and dirt from the thousands of intricate pieces we handle which range in size from a few ounces to 75 pounds.

"This efficient cleaning makes it easier for us to carry out subsequent operations quickly and economically. The parts are clean, warm and dry and ready for the next operation. It certainly helps in maintaining a steady operating schedule."

For you too, vapor degreasing can solve many cleaning problems, and help you to get fast, economical cleaning. Why not investigate now?



Before and after degreasing. Note thoroughness of the cleaning.

USE DU PONT TRICHLORETHYLENE DEGREASING SOLVENT

Thousands of manufacturers are using Du Pont Trichlorethylene for vapor degreasing.

Under various trade marks, Du Pont degreasing solvents have been widely used for many years. These solvents are stable . . . the best yet developed by Du Pont for metal degreasing. They stand up against contaminating and destructive materials which may be introduced in degreasing . . . assist materially in carrying out efficient cleaning.

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Please send me your free literature covering the vapor degreasing process and solvents. We are interested in cleaning _____ products.

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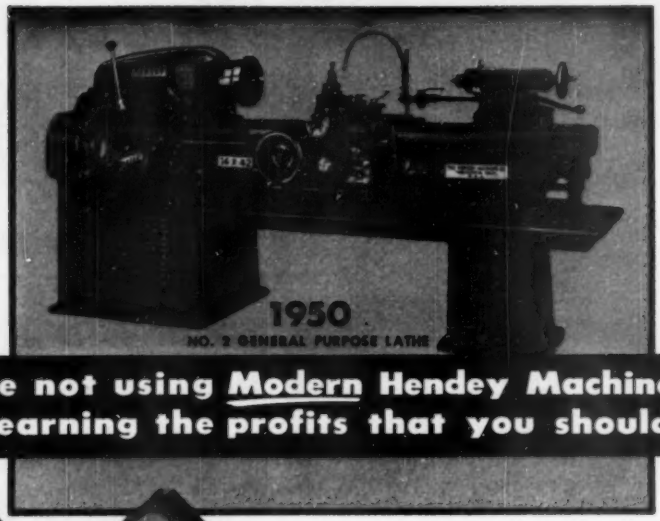
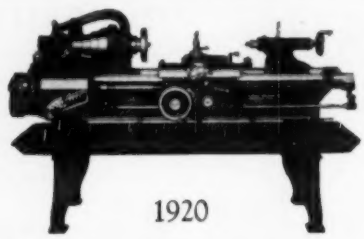


. . . If you are not using Modern Hendey Machines you are not earning the profits that you should!

THE HENDEY MACHINE CO.
HARDENED AND GROUND BED WAYS

The new Hendey No. 2 General Purpose Lathe is the ultra-modern successor of the famous Hendey Cone Head Lathe and was designed especially to perform tool room work with the greatest ease—at the greatest profit. A single lever instantly shifts the belt to any of the eight spindle speeds. There is an independent motor in the base and a unique design feature that completely eliminates belt pull on the spindle. The operator has a choice of 48 thread and speed changes. Both the carriage and tailstock ways are induction hardened and precision ground. Other *plus* features include cam lock or long taper key drive spindle noses—preloaded, super-precision spindle bearings—automatic lubrication—a swing of 16" and a wide choice of bed lengths.

This is truly a modern lathe to meet modern tool room requirements. Write for catalog.



Thousands of these old Hendey Cone Head Lathes are still in use throughout the world. Compare their performance against the new No. 2 General Purpose. The old Cone Head has overhead, manual belt shifting. Belt pull is direct on spindle from countershaft drive or motor on bracket. Top speed is 465 R.P.M. Bed is hand scraped, soft cast iron. A wonderful machine in its day, but not adequate for today's needs. How many of these in your shop? . . . losing money!

Continuous, advanced engineering by Hendey is worth watching—and must be watched if you are to earn full profits from your lathes and shapers. For complete particulars and prices, contact your nearest Hendey office.

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LOOKING for a machine to cut your grinding costs? Delta has the answer—bench- and floor-model grinders of many types with the exact current and speed you need to meet your requirements — surface grinders, standard tool grinders, carbide grinders, chip-breaker grinders, tool-and-cutter grinders, abrasive belt machines, etc.

You'd expect to pay much more for the all-around high quality of low-cost Delta grinders. For example, the Delta-Milwaukee standard tool grinder has illuminated safety shields built in. Wheel guards meet strict safety regulations. Ball bearings are lubricated for life. Tool rests are completely machined, fully adjustable.

Delta, you know, is the industry's most complete line of metalworking and woodworking machines. It's the only line with complete accessories to make every tool do more jobs — and often save you a larger investment in other machines.

So, for a grinder — or any other machine — look to Delta's complete, quality line first. Send coupon for catalogs and bulletins on the entire Delta line.

Sold only through authorized dealers. Easy time-payments available. Look for the name of your Delta dealer under "Tools" in the classified section of your telephone directory.

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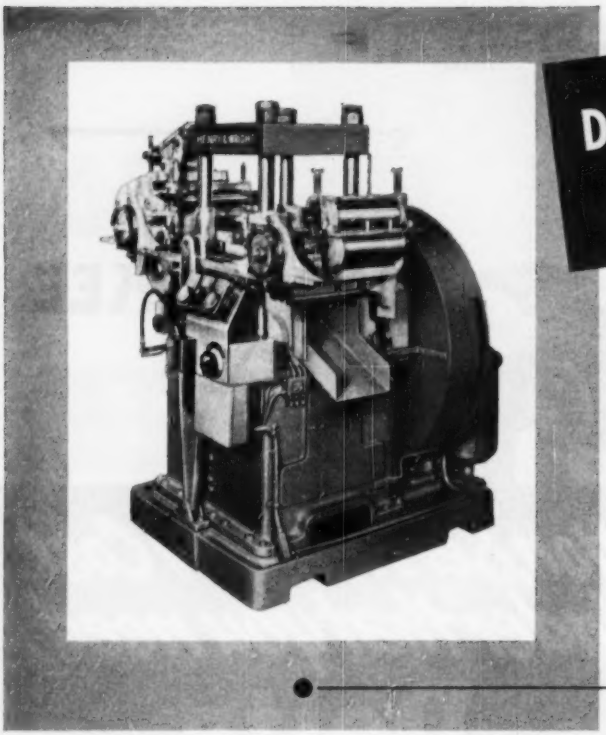


DOLLAR-PINCHING ON STAMPINGS

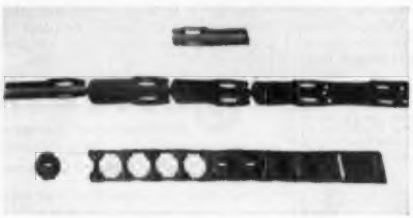
H. L. Judd Company uses Henry & Wright machines to keep production high, scrap percentage low.

H. L. Judd uses a group of 25-ton Henry & Wright machines for small, intricate stampings from light and medium gage material in coils. Larger machines (60-ton, 75-ton, 100-ton and 150-ton) turn out more complicated pieces from medium and heavy gage coil stock.

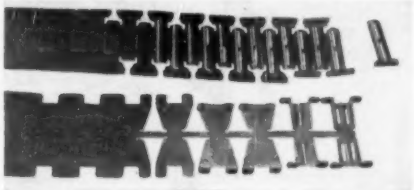
Using a battery of Henry & Wright dieing machines for more than 25 years, H. L. Judd Company, Wallingford, Conn., manufactures 300 different drapery hardware items, plus other products. Judd has found marked savings in producing lots from 5,000 up in these machines. Metals used are brass, stainless steel, carbon steel and aluminum. Gages range from light to heavy (.109 in.).

Versatility — you said it! But there's more. As the photos show, scrap losses are at a minimum. And H. L. Judd has found that Henry & Wright machines live up to their reputation: high-speed production and long die life — a combination unique with Henry & Wright machines. For economical stamping production, specify Henry & Wright. You'll scrap less . . . produce more . . . at less cost.

Small, intricate, drawn and formed stampings are turned out completed singly and in multiples at high speeds.



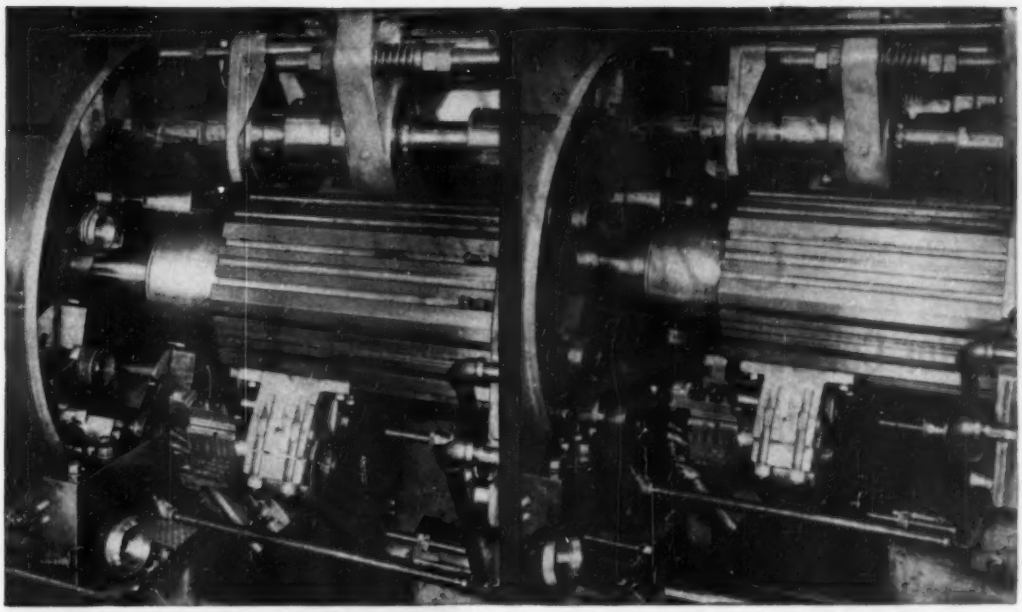
More complicated stampings are produced complete by Judd at rates in excess of 120 per minute for crane bracket (bottom) to approximately 500 pieces per minute for other parts.



For more details on Henry & Wright Machines, please write for catalog.

HENRY & WRIGHT
DIVISION OF HARTFORD-EMPIRE COMPANY

480 Windsor St., Hartford 1, Conn.



"INCREASED PRODUCTION— 500%"

Here's a direct quotation from Catawissa Valve & Fitting Co., Catawissa, Pa.

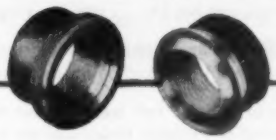
"Your 8" Model RPA-8 spindle Acme-Gridley Chucking Automatic, arranged for double index, has, as nearly as we can estimate, increased production in our plant 500%, on the work to which this machine has been assigned.

"In addition to this increase, we are obtaining a more uniform product than formerly when we moved the work from one machine to another. The operators also report that the ease of operation is considerable over the former method."

Such savings are not unusual for Acme-Gridley users—and here's why:

Sturdy frame construction; wide, open tooling zones, with plenty of room for timesaving power-driven auxiliaries; simple, direct camming—these and many other exclusive Acme-Gridley features all add up to *"More Good Pieces in the Pan at the End of the Day."*

May we show you how the modern, more versatile Acme-Gridley Automatics can increase production and cut costs in your shop?



JOB FACTS

PARTS: Forged Steel 2" Pipe Union, head and tail pieces.

MACHINE: Acme-Gridley 8" RPA-8 Chucking Automatics arranged for Double Indexing to finish both ends of a piece in one setup.

OPERATIONS: On head piece, 13— machine time 31.5 seconds.

On tail piece, 12 — machine time 31.5 seconds.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids • Centrifuges • Contract Manufacturing

Backstand Method Saves Time!

Le Roi Co. cuts finishing time on forged handle from 5 minutes 11 seconds to 1 minute 32 seconds

Problem: The Le Roi Company, in Cleveland, Ohio, used set-up wheels to finish forged paving breaker handles. This finishing operation required 5 minutes 11 seconds on the average per handle . . . was too long, too costly.

Solution: The Le Roi Company switched from the set-up wheel to the backstand belt method for this finishing job.

Result: An Armour abrasive belt was used and finishing time was reduced to 1 minute 32 seconds per forged handle *. . . saving 3 minutes 39 seconds for each handle!*

Manufacturers of hundreds of different industrial and consumer items have proved that the backstand belt method is more efficient and more economical than the set-up wheel.

If you are grinding, polishing or finishing flat or contoured surfaces, cast pieces, stamped pieces or forged pieces the backstand belt method can help you with your production problems.

To learn more about the many advantages of the backstand belt method, write today for our free booklet.

We recommend buying through your industrial distributor

Armour's abrasive belts are only part of a complete line of abrasives built to rigid quality specifications. There are sheets, rolls, discs and other more specialized shapes.

MAIL THIS COUPON TODAY

Please send me the booklet "Facts about Backstand Belt Grinding and Polishing."

Name .....

Title .....

Firm .....

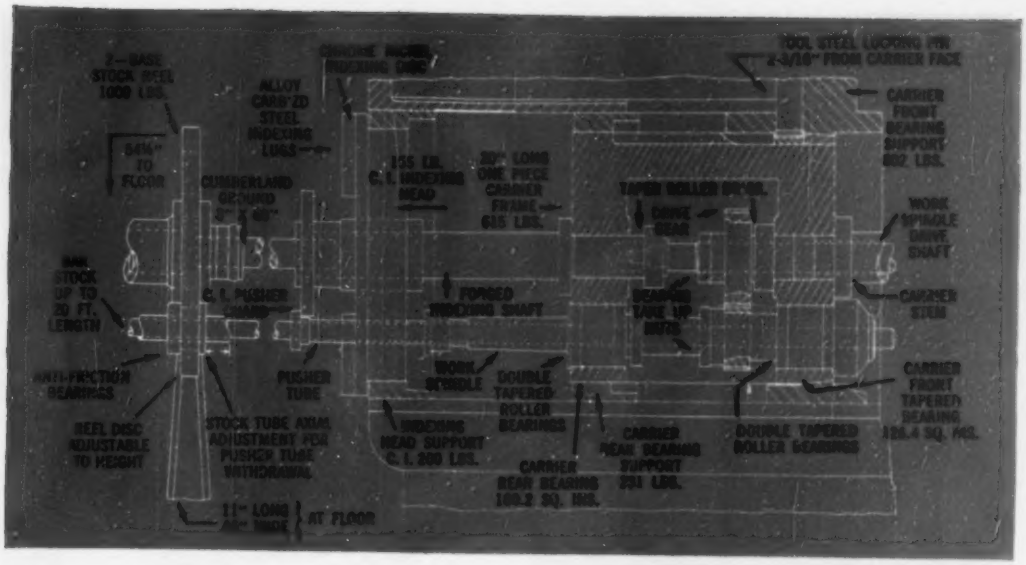
Address .....

City ..... *Zone* ..... *State* .....

ARMOUR *Coated Abrasives Division*

SHEETS • ROLLS • BELTS • DISCS

Armour and Company
North Benton Road • Alliance, Ohio


2—BASE STOCK REEL 1000 LBS.
ALLOY CASE'D STEEL INDEXING LUGS
CUMBERLAND GROUND
BAR STOCK UP TO 20 FT. LENGTH
C. I. PUSHER
ANTI-FRICTION BEARINGS
REEL DISC ADJUSTABLE TO HEIGHT
PUSHER TUBE
STOCK TUBE AXIAL ADJUSTMENT FOR PUSHER TUBE WITHDRAWAL
11" LONG AT FLOOR
155 LB. C. I. INDEXING HEAD
20" LONG ONE PIECE CARRIER FRAME 615 LBS.
FORGED INDEXING SHAFT
WORK SPINDLE
DOUBLE TAPERED ROLLER BEARINGS
INDEXING HEAD SUPPORT C. I. 200 LBS.
CARRIER REAR BEARING 169.2 SQ. INS.
CARRIER REAR BEARING SUPPORT 251 LBS.
TAPER ROLLER BEVEL DRIVE GEAR
BEARING TAKE UP NUTS
DOUBLE TAPERED ROLLER BEARINGS
TOOL STEEL LOCKING PIN 2-9/16" FROM CARRIER FACE
CARRIER FRONT BEARING SUPPORT 302 LBS.
WORK SPINDLE DRIVE SHAFT
CARRIER STEM
CARRIER FRONT TAPERED BEARING 126.4 SQ. INS.

FIRST THINGS COME FIRST

Upon the Spindle Carrier of an "Automatic" falls the responsibility of accurately presenting and holding the work to — and in contact with — the tools. The basic design of the Carrier is obviously of first importance in the protection of the work spindles from the strain of heavy cuts and weight of the bar stock. Then, in proportion to the Carrier's ability to handle the full load is the importance of any supplementary facility that shares the load.

1. **The 1½" Six Spindle CONOMATIC CARRIER gives better support to the work spindles under heavy loads.**

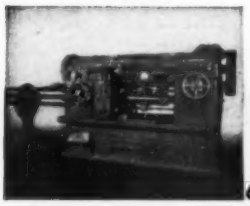
   The thick, heavy ribs resist strain. The tapered front bearing and the spindle drive gears are within 3" and 9¼", respectively, of the collet faces. The wider spaced bearings give better alignment and load distribution. The Carrier is free of Cross Slide positive stop pressure.

2. **The entire INDEXING MECHANISM is supported by the Top Bed as well as the Base. There are fewer wearing parts.**

   The Indexing Head takes the brunt of the indexing load. It is supported by the short frame member midway between the Carrier and the Stock Reel. It is joined to the latter by strong center shafts.

3. **The STOCK REEL is designed to handle longer and heavier loads.**

   The two Stock Reel Bases are independent of the machine and relieve it of the heaviest part of the bar load during the cutting and indexing movements. Adjustable alignment gives freer stock-feed action.

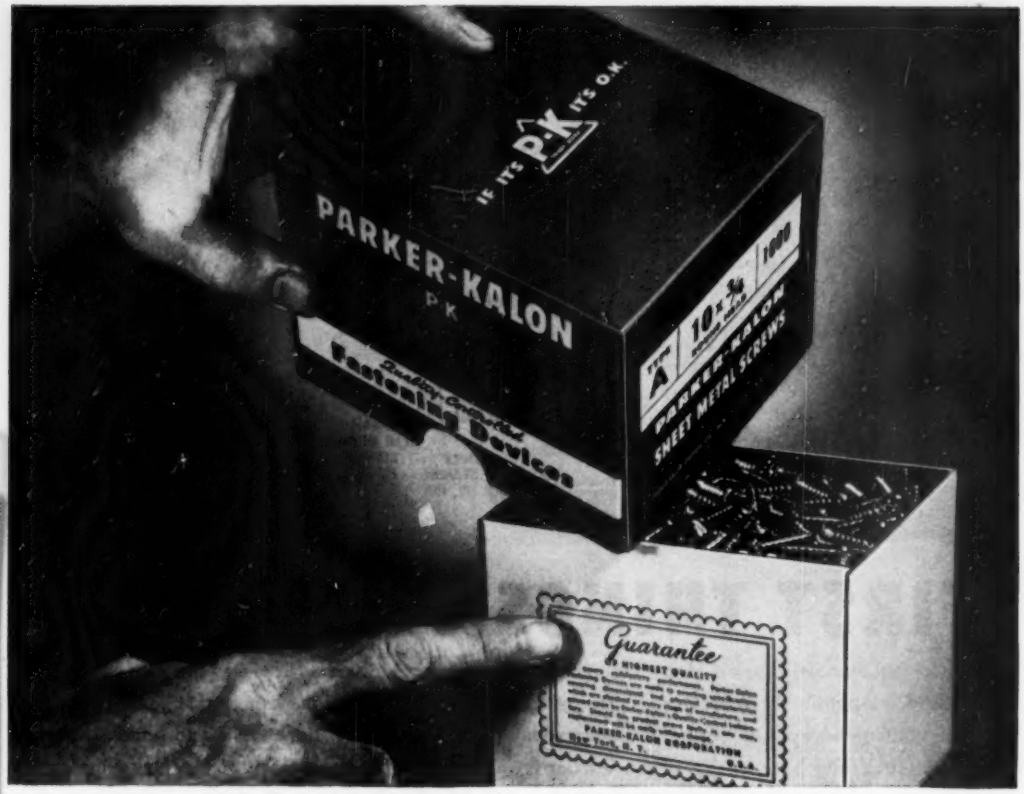


Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.



HOW TO UNCOVER EXTRA SAVINGS...

Most manufacturers today are aware of the advantages of using hardened Self-tapping Screws. They save time and simplify assembly by eliminating tapping for machine screws, by avoiding inserts in plastics, by using one operation fastening in place of bolting, riveting, soldering.

But they still may be missing some substantial *extra* savings, because all Self-tapping Screws are *not* alike. Planned savings don't always pay off.

Screws are a bit like people. If they lose their heads when under pressure . . . or turn out to be "softies" . . . or just don't "square up" on jobs, they can slow up a job for sure. You can avoid this by specifying "Parker-Kalon".

When Parker-Kalon developed the *first* Self-tapping Screws, over 35 years ago, they learned how to keep hardness and toughness properly balanced—how to make threads sharp and clean from head to point—in every screw. That's why every screw in every box can be *guaranteed* first quality.

Start making the extra savings you've been missing. Find out why the manufacturers of so many of the nation's best known products say, "If it's P-K* . . . it's O.K.!" A P-K Assembly Engineer will call at your request. Parker-Kalon Corporation, 200 Varick St., New York 14, N. Y. Sold everywhere through accredited Distributors.

*TRADE MARKS REG. U.S. PAT. OFF.

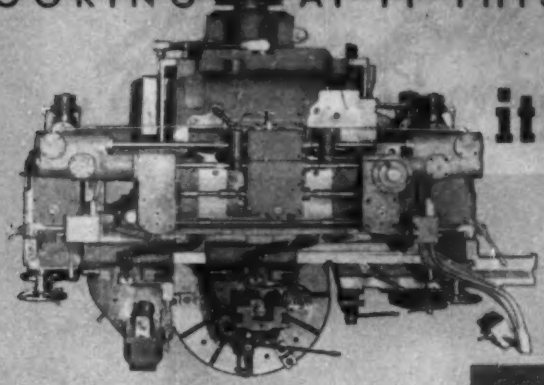
P-K TRADE MARK

The Original

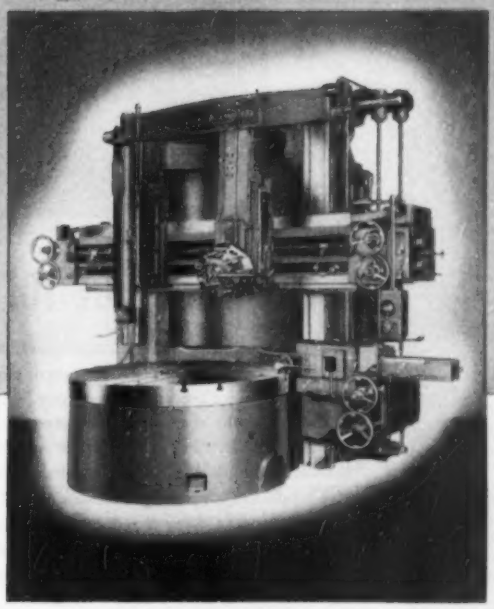
PARKER-KALON* SELF-TAPPING SCREWS

OTHER P-K PRODUCTS. Cold-Forged Socket Screws, Wing Nuts, Thumb Screws • Hardened Screwnails and Masonry Nails • Shur-Grip File and Solder Iron Handles • Metal Punches • Bumper Regulators and Accessories

LOOKING AT IT THIS WAY . . . .



it has Massive Depth and Width . . .



Rugged Structure from Floor to Top. A machine for tough Jobs as shown below with assurance of a High degree of Accuracy.

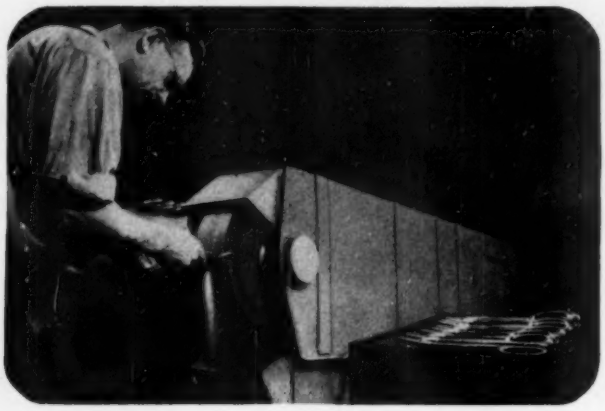
BULLARD

CUT MASTER VERTICAL TURRET LATHES

provide the modern features for more Economical Manufacturing. Replace slow machines with the Faster Cut Masters. Built in 30—36—42—54—64 & 74" sizes

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

COATED PRODUCTS COMMENTS



Best bet for the "Hot" Jobs

Where intense frictional heat is generated in grinding metals, a specially designed heat resistant abrasive belt naturally is your "best bet." That's why the *new improved* Resin Industrial Cloth Belt by CARBORUNDUM is being used increasingly. It's a superior coated abrasive product in which tough, durable ALOXITE aluminum oxide abrasive is securely bonded to heavy duty cloth backing by a thermosetting resin adhesive.

"CARBORUNDUM's Resin Industrial Cloth Belts ground 3000 steel pins to 1200 for conventional glue bond," says one manufacturer. "Lasted from 2-4 times as long as glue-bond material," states another.

For fewer belt changes and lower production costs on "hot" grinding jobs—specify Resin Industrial Cloth Belts by CARBORUNDUM. The Carborundum Company, Coated Products Division, Niagara Falls, New York.

COATED ABRASIVES BY

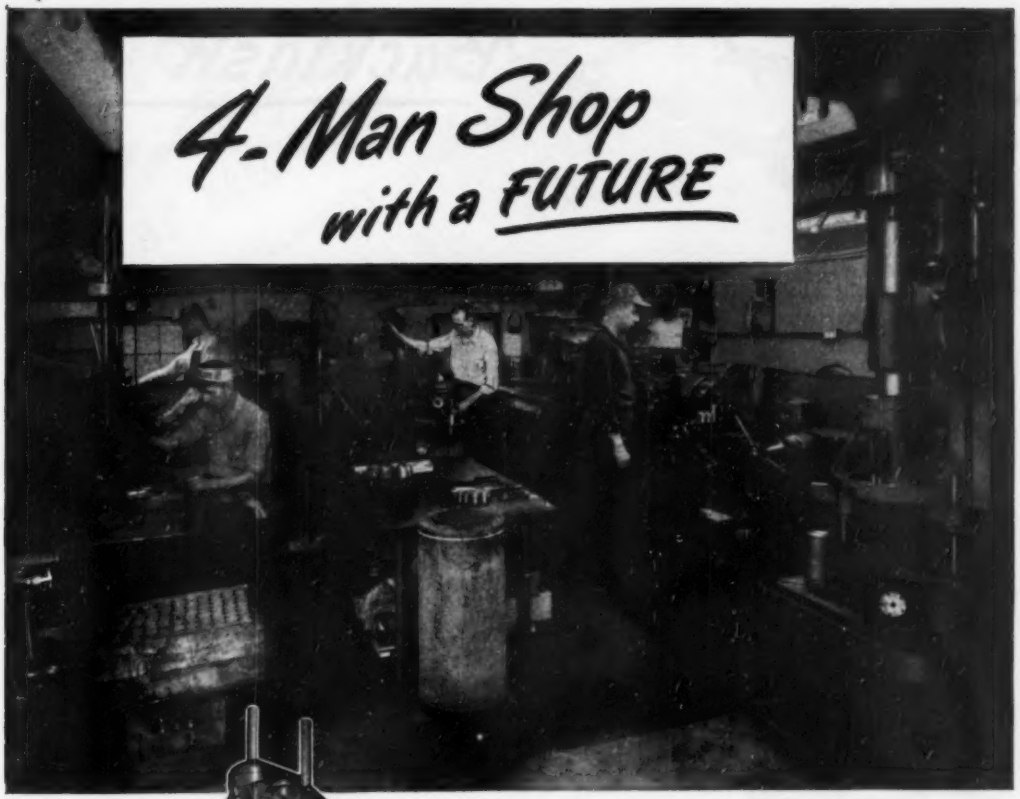
CARBORUNDUM

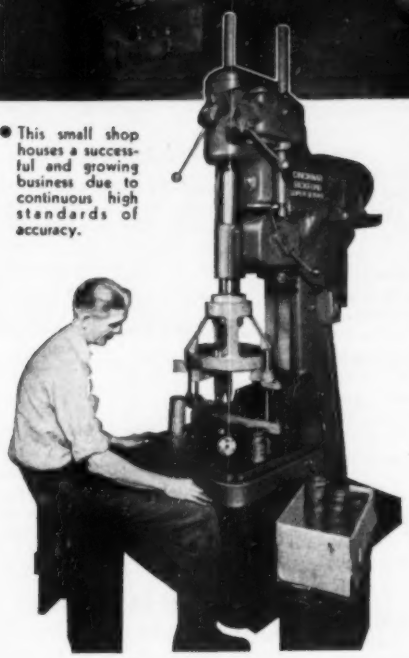
TRADE MARK

Making ALL abrasive products...
to give you the proper ONE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

4-Man Shop with a FUTURE





● This small shop houses a successful and growing business due to continuous high standards of accuracy.

Quality equipment pays the small operator as well as the large.

The Schoening Machine Service, 3284 Dunn Street, Cincinnati, Ohio—business, production machining—small in size—big in accomplishment—testifies to the value of fine tools.

The Cincinnati Bickford Super Service Upright Drill, illustrated, is drilling five $\frac{13}{32}$" holes and four $\frac{1}{2}$" holes to a plus or minus .005" tolerance in a steel cover $\frac{5}{16}$" thick—a production job.

Mr. Schoening tells us he has held accuracy to a plus or minus .0002" on production reaming jobs.

Write for Bulletin No. U-25.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radial, 7½" dia. col. 21½" arm to 56" dia. col. 12" arm
General purpose Uprights 21" to 28" sizes
Production Uprights 21" to 28"
Jig Borers, Portable Horizontals
Spacing Table Machines

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

STOP
Tap Breakage!

SAFE Torques ALWAYS with the Jay-Dee Tapping Attachment

Instead of using coiled springs to provide driving pressure, the Jay-Dee has a new resilient clutch . . . 150 times more effective than steel . . . to produce safe torques at all times. Definite torque settings for given taps or sizes can be changed in a few seconds without wrenches.

Used for horizontal or vertical tapping, stud driving, blind or through holes. Jay-Dee Model K-1 handles taps ⅛"-1 ¼" USS. Other units available.

GUARANTEED FOR 12 MONTHS!
Write for bulletin.

•

Designed Especially for
Carbide Tools

WICKMAN
GF-3 Universal Grinder

This versatile bench machine can be used as a surface grinder, chip-breaker grinder, or universal tool and cutter grinder with all types of diamond wheels. It has both swiveling table and swiveling motor with micro setting scales for accurate grinding and resharpening of cutters, reamers, counterbores, etc.

Powered with 1 HP 2850 rpm reversible motor, with built-in 12 gph pump and coolant reservoir in base. Many other features for operating ease and versatility.

Literature available upon request.

THE Wickman MANUFACTURING CO.
15533 Woodrow Wilson Ave.
DETROIT 3, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Tool-Steel Code Correction

I have carefully studied Part 1 of your special report entitled "How To Work Tool and Die Steels" (*AM*—Oct. 16, '50, p145). The job you have done is a good one of assembling the data which we have been putting together in cooperation with various technical societies. The JIC Numbering System is not yet nationally adopted and as chairman of Sub-committee B52.1 of the American Standards Association, it is my responsibility to review this and other systems of identification and classification. From the work to date it is apparent that the JIC system will not stand in its present form but will be subject to some revision within the next several months.

Those who have worked on, and know the intent and background of, the JIC system, have always feared that other people would arbitrarily assign numbers to steels as they were developed and that the pattern would again become hodgepodge. I must, therefore, call your attention to the steel which you have numbered T-16 arbitrarily and suggest that you immediately change this to T-4, which is the official Gorham code for an 18-4-1 high speed steel with 4 to 5% cobalt. You have probably been confused by the fact that you list the steel at 5% cobalt, whereas the 6th Edition of the Gorham Classification shows it as 4% cobalt. Actually this is one and the same steel and should not be designated differently. Calling the steel T-4 will eliminate the necessity of using the letters T-16.

When will Part 2 of this report be published? Could we have a series of reprints or tear sheets of both Part 2 and Part 1 for use among our personnel?

George A. Roberts,
Chief Metallurgist
Vanadium-Alloys Steel Co.
Latrobe, Pa.

The error in classification pointed out by Mr. Roberts was caught too late to correct in Part 1. It has been corrected in Part 2 of the report, published in this issue. In Part 2, which goes considerably further than the JIC standards in classifying tool and die steels, it has been absolutely necessary to assign numbers arbitrarily to these additional groupings. To avoid confusion with subsequent standards each new number has the suffix A (as H-9A). This will serve immediate requirements of industry and at the same time leave the basic system in the hands of the various committees working on standards for tool and diel steels.—Ed.

Plant Protection Data

We are currently building up our Plant Protection and security forces, and any information you can pass along to us relative to our program would be appreciated.

Eugene B. Kelly,
Secretary, Security Council
Legal Department
The Dow Chemical Company
Midland, Mich.

By coincidence, this letter was received the same day our "Disaster Control" Number (Nov. 13) was published. This provides plant protection-and-security information under the subjects of "The Organization" and "Sabotage."—Ed.

Tool Steel Report Helps

Congratulations on Part I of your splendid article on "How to Work Tool and Die Steels." Our people are quite enthusiastic about the straightforward, understandable manner of your explanation.

I, myself, have found it extremely

BORES OF *Any Length* MAY BE MICROHONED*

remove stock efficiently, generate accuracy

This drawing shows a hydraulic cylinder 36 in. in diameter and 33 ft. long and the tool used to MICROHONE it. This cylinder is held to a .001 in. tolerance for straight and round for its full length.

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROHONING* is the only production, stock-removing process that can be used on any length bore without loss of accuracy. Bores from .006 in. to 40 ft. in length are being MICROHONED with MICROMATIC equipment.

MICROHONED accuracy is not dependent on rigid alignment of the quill. Cutting pressures are balanced and act radially from the center of the tool. The large contact area stabilizes the tool in the bore. Tool construction isolates the cutting edges from machine vibration, and permits tool to align itself. The long plane-like abrasive levels off surface waviness and generates a round, straight bore. Any amount of stock can be removed, and size held to close tolerances. Surface finish may be held to any degree of uniform roughness, and duplicated in every bore.

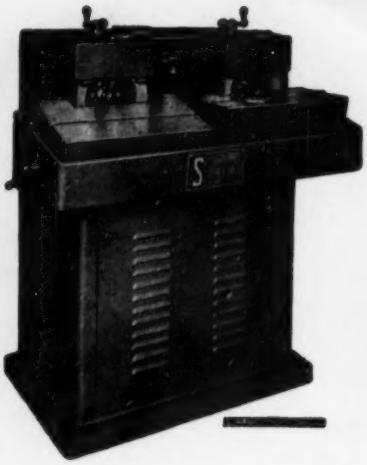
*Registered U.S. Patent Office

Write for Cross Hatch on MICROHONING Long Bores

Micromatic Hone Corporation 8100 SCHOOLCRAFT AVENUE DETROIT 4, MICHIGAN

District Field Offices: 1323 So. Santa Fe., Los Angeles 21, California • 614 Empire Building, 206 So. Main St., Rockford, Illinois
55 George St., Brantford, Ontario, Canada — Micromold Manufacturing Div., Boston Post Road, Guilford, Connecticut

TWIN WHEEL
WET OR DRY
TOOL GRINDER

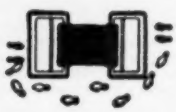


For Carbide, Stellite, or High Speed Steel Tools.

one step from rough to finish grind

TYPE TD
10TD 10" 14TD 14"
TWIN WHEEL
TOOL GRINDER
(ALSO SINGLE CUP WHEEL)

Heavy Duty
Wet or Dry
10"-14" Wheels



OLD WAY

Lost time between rough and finish grind.

Floor space wasted — Grinder must be away from wall.

NEW WAY

One step from rough to finish grind.

Conserve floor space — place Grinder against the wall.

POSITIVELY NO SPRAY OR SPLASH WHEN GRINDING WET!

WRITE FOR BULLETIN 18 TODAY!

ALSO:

GRINDERS—ALL KINDS! UP TO 100 H.P.
BUFFERS—POLISHERS UP TO 60 H.P.
ABRASIVE BELT MACHINERY
SPECIAL MACHINERY

THE STANDARD ELECTRICAL TOOL CO.

2480 WEST SIXTH ST. CINCINNATI 4, OHIO

informative and am glad that we were able to make some small contribution to its writing.

At a recent meeting here with some of our branch sales people, Part I of your article was discussed and I have been requested to write, asking you about the possibility of obtaining fifty reprints of this and the forthcoming Part 2 for distribution to our own company personnel. As you can see, we are betting that the balance of material to be covered will be as valuable as we have found this first installment to be.

Best wishes for a continuation of this success.

Tom G. Winterton,
Assistant to Vice-President
Latrobe Electric Steel Co.

Readers can form their own opinion of Part II by turning to page 147 of this issue.

Wanted: Chip-Handling

I would like more information on the chip-disposal and oil-recovery installation as described on page 96 of your Oct. 30, 1950, issue, (Venturi Blowers Handle Crushed Chips Rapidly), with the idea in mind of installing a duplicate installation at this plant. Where can we obtain plans, costs, contractors, and soon?

Capt. R. S. Caldwell,
Commanding Officer
U. S. Naval Ordnance Plant
Macon, Ga.

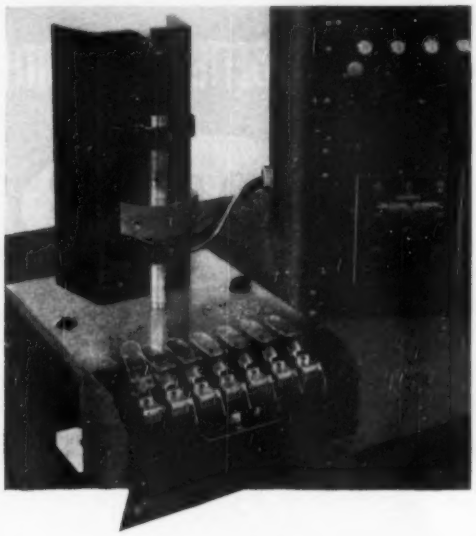
This system was designed and installed by the Turbine Equipment Co. and full information can be obtained from Allen O. Hopper, Vice-President, whose office is at 75 West St., New York 6, N. Y.

FOR PEOPLE WHO WATCH COSTS AND QUALITY!

FEDERAL INDICATING GAGE CUTS INSPECTION COSTS . . . IMPROVES PRODUCT QUALITY

Why wait? Open this package today! People who watch costs and quality find Federal Gages pay a nice bonus every day of the year. Here's an example:

The customer who bought this Federal Electronic Sorting Gage previously used a two-stage method for inspecting thin copper washers. First the washers were flattened between two parallel bars, giving an overall check on thickness. Then, they were tested with a comparator and segregated by hand into several thickness categories.



The customer asked Federal for a better means of gaging these paper-thin, hard-to-handle washers. This Gage, Model 144 B8, is the answer.

(1) It's 4 times faster than the previous gaging method.

(2) It eliminates fussy handling and damage to washers at inspection.

(3) It's an *automatic* gage. The gaging contact is self-lifting: the disposal gates are self-opening.

(4) It's foolproof — no washers can be improperly segregated since the correct gate opens automatically after each part is gaged.

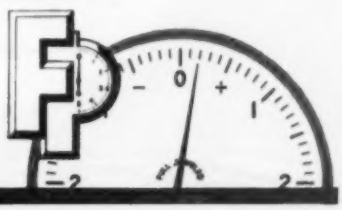
(5) It cuts handling in half — one gage does the same job previously requiring two.

(6) It's precise — segregates washers into 5 O.K. groups (.0001" difference between categories) — also rejects over and under sizes.

This is the kind of job Federal is doing for industries of all kinds — in fact there are over 20,000 individual gage designs in our files, each representing a case where Federal has helped a company obtain better, more economical dimensional control. No greater fund of practical gaging knowledge is available anywhere. If dimensional control is your problem, consult Federal first. It's the natural and economical thing to do. Federal Products Corporation, 1212 Eddy Street, Providence 1, R. I.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing <u>all types</u> of DIMENSIONAL INDICATING GAGES



proved in more than 10,000 shops...

KNURLED SOCKET HEAD CAP SCREWS AND STRIPPER BOLTS

. . . faster, easier driving with firm finger grip on the knurled heads—spin in with hexagon wrench.

AGE MAKERS' SUPPLIES • DANLY TOOL, DIE AND GAGE MAKERS' SUPPLIES • DANLY TOOL,

PRECISION DOWEL PINS

. . . specially hardened (58-60 Rockwell C) to resist upsetting—easier to drive with tapered leading ends to "pilot" the pin into the hole.

PPLIES • DANLY TOOL, DIE AND GAGE MAKERS' SUPPLIES • DANLY TOOL, DIE

DANLY TOOL, DIE AND GAGE MAKERS' SUPPLIES

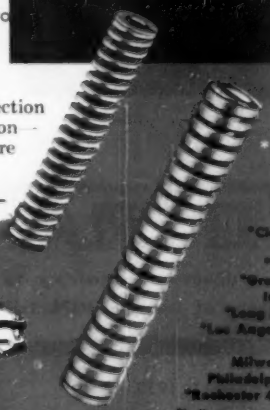
assure tool and die makers of standard part quality fully consistent with good tool making practice. The Danly line includes many items in addition to those shown here such as set screws, bushings, toggle clamps and laps. A nation wide system of completely stocked Danly branches assures quick, convenient delivery.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

E AND GAGE MAKERS' SUPPLIES • DANLY TOOL, DIE AND GAGE MAKERS' SUPPLIES • DANLY TO

JOB TAILORED DIE SPRINGS

. . . two complete size ranges, for medium pressure and high deflection or high pressure and medium deflection — precision coiled and ground square for full end bearing.



PRECISION DIE SETS . . . STANDARD AND SPECIAL

BUILD BETTER DIES WITH

DANLY

TOOL DIE AND GAGE MAKER'S SUPPLIES

***WHICH DANLY BRANCH IS CLOSEST TO YOU?**

*Chicago 50, 2100 Laramie Avenue
*Cleveland 14, 1550 East 33rd Street
*Dayton 2, 990 East Monument Avenue
*Detroit 16, 1549 Temple Avenue
*Grand Rapids, 113 Michigan Street N.W.
Indianapolis 4, Indiana, 5 West 10th Street
*Long Island City 1, 47-28 37th Street
*Los Angeles 54, Ducommun Metals & Supply Co. 4890 South Alameda
Milwaukee 2, 111 East Wisconsin Avenue
Philadelphia 44, 18 West Chelten Avenue
*Rochester 4, 16 Commercial Street

*Indicates complete stock

SPOT NEWS of Metalworking

- **Molybdenum disulfide is being used as a lubricant** for excessive-pressure bearing surfaces. It is insoluble in oils, is painted direct on steel heated to 662 F, and forms a homogeneous layer. It is stable up to melting point of 2165 F, and is a highly satisfactory dry lubricant at −70 F. It withstands loads up to 3000 psi at 400 fpm velocity.

- **50 geared-head lathes, made from imported components,** are scheduled for production during first year of operation of Government of India machine tool plant to be built at Bagalore. Factory will take five years to complete, will cost around $17 million. It expects eventually to have capacity for making annually 1200 lathes, 480 shapers and 120 heavy-duty drilling machines.

Jet propelled automobile will be produced in Germany shortly. Dr. Ferdinand Porsche, German designer who invented the "Volkswagen," has been working secretly in Dellach (Carinthia) on the plans, now completed.

- **Several metalworking companies seeking defense orders** are concentrating on prospective contracts requiring engineering work as well as strictly production facilities. By going after "engineered jobs," they expect to end up with negotiated contracts instead of losing out on a strictly low-bid basis.

- **French steel is being offered in this country** at double the domestic price for next April delivery. Some tonnage for earlier delivery is available at a boost of only about 25% over the prevailing market price.

- **Detroit expects truck production to be as big in '51 as this year,** and perhaps bigger. Much of truck output will be military vehicles or standard units for defense forces.

- **Forced savings plan to combat inflation** is under consideration by Truman administration. Future wage increases, after fifth-round, would be paid in savings bonds not cashable until some later date when they would have less inflationary effect.

- **How to protect pension rights of workers** if they are forced to shift to war jobs is one of problems which new Office of Defense Manpower is tussling with. There is talk of guaranteeing these workers reemployment rights in their old jobs, but no plan has jelled.

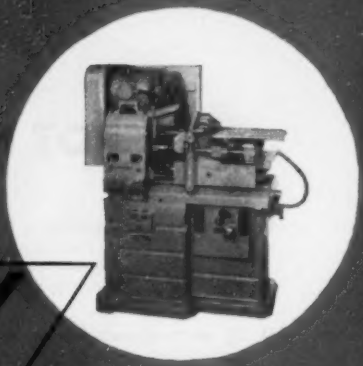
Hot rolling stainless compressor blades for a gas turbine is being done successfully by General Electric. This permits production from sheared plate without waste (except for flash) and reduces operations.

- **General Motors and other five-year contracts** may be upset if Wage Stabilization Board nullifies automatic wage raises. UAW-CIO president Walter Reuther takes position that if any part of GM contract is knocked out, then entire contract is subject to renegotiation. Other unions will feel the same way.

- **Chevrolet's production schedule for first quarter of 1951** is same as in similar quarter of this year, when 463,901 units were turned out. Chevrolet anticipates having materials to meet this schedule, though it probably will have to resort to considerable number of materials substitutions.

- **U. S. Air Force plans to buy a substantial number of Canberra twin-jet medium bombers,** London sources say. Canberra bomber is in quantity production at the English Electric Co. factory at Preston, and Ministry of Supply has placed sizable orders for the plane with three other British aircraft firms: A. V. Roe, Short Brothers & Harland, and Handley Page. The Canberra is slated for production in Australia, may also be built in Canada.

STANDARD



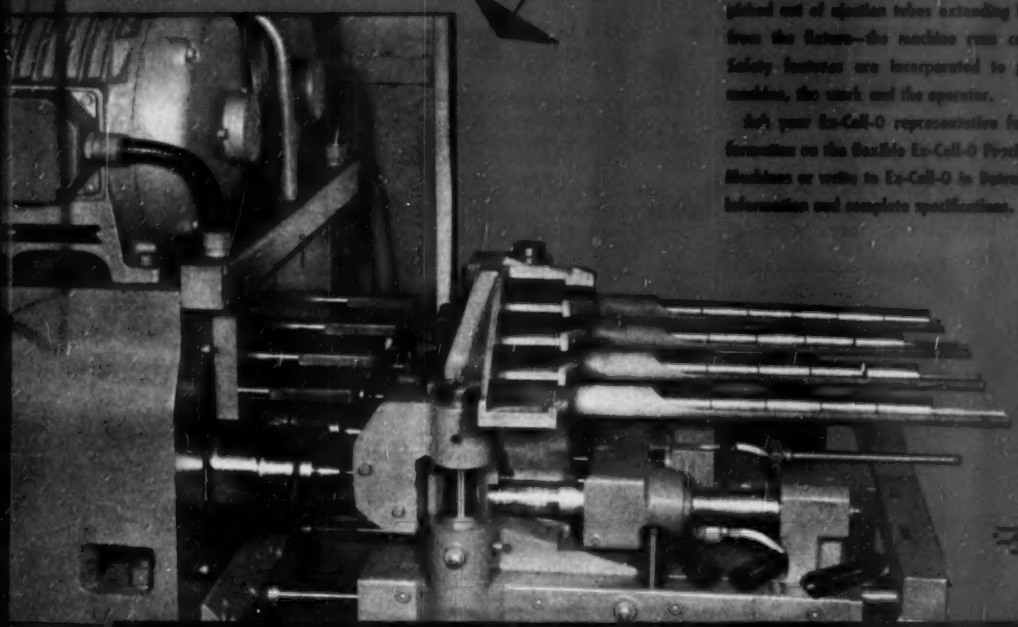
Yet Automatic!

EX-CELL-O 2112-A Precision Boring Machine Readily Tooled for a Variety of High Production Jobs

Standard Ex-Cell-O Precision Boring Machines can be tooled either as simple, general-purpose machines or as automatic, high production, single-purpose machines. The basic machine is never obsolete—can always be re-tooled for the next job.

The machine illustrated here precision bores blind holes approximately 11/16" diameter and 1¼" deep in gray iron hydraulic components. Parts are loaded into indexed chutes and the finish-bored parts are picked out of ejection tubes extending horizontally from the fixture—the machine runs continuously. Safety features are incorporated to protect the machine, the work and the operator.

Ask your Ex-Cell-O representative for more information on the flexible Ex-Cell-O Precision Boring Machines or write to Ex-Cell-O in Detroit for more information and complete specifications.



EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

Washington's great fear is of World War III. Plans are being laid accordingly.

It means our up-again, down-again mobilization is up-again, but we still aren't committed to all-out mobilization. Right now U. S. sights are set on a 2.8-million man fighting force, and a $50-billion-a-year defense spending rate before were through. That's a little higher than two weeks ago.

What the picture looks like six months from now is anybody's guess. If we force and/or negotiate an end to Korean fighting in the next few weeks, plans may still be eased to a more stable level.

• • •

The West is faced with four courses of action, none of them good.

First is "give up" in the Pacific, west of Japan. Mao Tse Tung, if he chooses, can take all of Asia: Korea, Indo-China, Malaya, maybe even India. The West has nothing, save possibly the A-bomb, that can stop the 3-million men he has under arms.

Second, we can play the Russian dupes, and dissipate our resources in a long war with China, a war that probably wouldn't stop short of Moscow.

Third, we can appease the Reds, but after recent Red successes, the price has gone up too high.

Or, we can A-bomb Russia now, as many people wish, but with little on hand for a follow-up.

"The only other out is a miracle" such as a red withdrawal from Korea along with a U.N. settlement.

• • •

One thing is certain: It will be months before we are irrevocably committed to any particular theory of mobilization. Dollars appropriated for defense now can always be adjusted up or down later. It means, short of war now, we'll probably change our minds again before the final build-up pattern is set.

• • •

Defense Department's new guided missile program means business for industry. They're ordering anti-aircraft missiles immediately.

Plans are to raise the year's $200-million missile-spending figure to $800 million, and to $2 billion in 1952. The 1954 target is $3 billion.

• • •

Some of the copper that's been going to Red China via devious 'round-the-world routes on U. S. ships may have been sold by Chiang Kai Shek's Nationalists.

Traders are saying that the copper—delivered to Chiang as Japanese reparations—was sold to the Reds through two U. S. merchant exporters.

Applications for government loans to expand defense production facilities are being accepted at NSRB.

But it looks as though the $600 million immediately available may be spoken for pretty quickly. If you want a share of this pie, do this:

File your application as soon as possible.

Cut your request to the minimum dollars—no water.

And, most importantly, tie your need for money closely to defense contracts.

Actually, there's $2 billion available for these loans, when and if Congress wants to authorize the use of the other $1.4 billion.

• • •

President Truman finally wrote the ground rules for hiring "dollar-a-year" men to fill mobilization posts. They probably won't bring very many industry men into federal jobs.

His policy is that any citizen should serve his country at government wages if he is needed.

WOC's—without compensation employees—should only be hired when qualified employees aren't available through the Civil Service Commission, with CSC to police the directive.

However, those WOCs that are hired will be allowed to keep their industry jobs without running afoul of federal laws to the contrary.

• • •

It's beginning to look as if an excess profits tax may pass in the short session, despite pressure for a straight corporate levy instead.

Truman's plan probably won't be passed exactly as requested, though. Right now the odds favor a milder EPT plus a higher corporate levy to pay added mobilization costs.

• • •

Revision of the BLS cost-of-living index may mean trouble for employers with escalator wage clauses tied to living costs.

BLS now points out a 1.3-point error in its consumers price index because it didn't figure in rentals of new property. General Motors was using a .8-point rent correction, but has now accepted the 1.3 BLS adjustment which raised the index to 176.1.

The result is a 3-cent an hour GMC wage hike, instead of the 2-cent an hour figured with .8.

Starting in February, with January figures, BLS will publish two figures—the revised and unrevised—until mid-1952 when there will be a major revision of the index.

• • •

BIR has ruled that money paid into trusteed pension plans as detailed in union contracts are fully deductible as business expenses if, (1) the plan is permanent, and (2), if benefits are definitely—and actuarily tied to payments.

GROWTH is a fine thing... BUT NOT FOR GAGES
DIMENSIONAL STABILITY CONTROLLED
For many years Sheffield has cooperated with the best-known institute of technology in this country in an independent pioneering and development program. The purpose was to discover, if possible, some way to prevent steel in fixed-size gages from growing as it aged. This project has produced so much of value that its findings are now being utilized by our Armed Forces.
With the remarkable progress attained, it has been possible to work out dimensional stabilization processes for Sheffield Nitrigages that have brought Sheffield gage users new plus values in more accurate performance over a longer period of time.
In a recent investigation of gages stock-piled by a large purchaser, not one of the Sheffield Gages checked showed any growth whatever—although as much as 30% of some other makes had to be rejected for dimensional instability.
"Dimensional Stability Controlled" is only one of the many plus values you get in Sheffield Nitrigages. Other advantages are less initial wear, greater resistance to abrasion, less danger of chipping and longer overall service life.
You'll find "It's Wise and Thrifty to Specify Sheffield" fixed and adjustable limit gages from Catalog No. 4849. Write for this catalog if you don't have one.
SHEFFIELD
the Sheffield corporation
Dayton 1, Ohio, U. S. A.

Detroit

The pace of incoming machine tool orders is slowing down. Some feeling is expressed in Detroit shop circles that the automobile companies may be a little less certain than they were six weeks ago—a little less sure of what they intend to do for 1952 models.

The big engine programs in the shops — Chrysler, Buick, Ford—are still there. But the volume of additions which would normally be expected is not materializing on schedule. Of course there is still time, plenty of it. But pauses in incoming orders at this stage are at least a little out of routine.

This seems true, perhaps even more notably, in die schedules. One substantial program for a 1952 line has just about come to a standstill. Apparently this major producer has some changes in mind which would revise earlier, apparently hard-and-fast designs.

Fisher and Chrysler, meanwhile, are said to have a lot of design changes on their boards for 1952. None of it has been released yet.

• • •

There is still no defense activity of note in the Detroit shops. But there are some signs that it may not be far off. Three automobile companies, at least, are inquiring on tooling for war materiel whose precise shape, at this juncture, is not yet revealed. Some belief is that these programs are classified secret—at least the tool shops get no satisfaction when they try to inquire past the blueprint.

• • •

Meanwhile, letters from the Ford aircraft engine operation at Chicago and the Cadillac tank job at Cleveland indicate that the machine tool buying phase is nearby for both of them. No releases of any consequence are yet out, though.

Like the rest of Detroit industry, the machine tool shops are wondering when arms programs will finally get under way. They are completely at a loss to understand the slowness of the entire preparedness effort.

• • •

Intermittent steel shortages, coupled with problems of other sorts and with changeovers, reduced automobile and truck output to low ebb as the turn was made into December. Total assembly volume slumped down to around 120,000 units.

It was the first time in 1950 that the figures were near those of comparable 1949 weeks, except for short periods during the Chrysler strike in the fore part of the year. Slowed operations at Chrysler and Ford during late November were expected to iron out in December, with attendant improvement in industry volume.

• • •

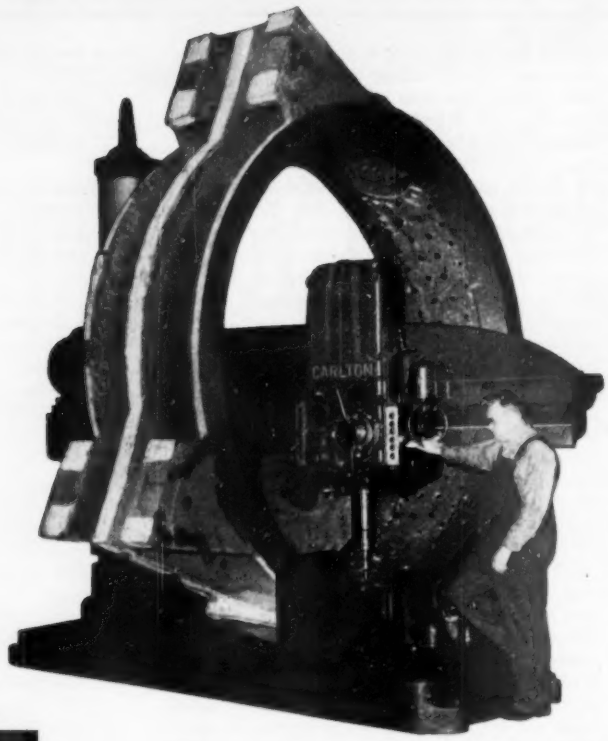
Two 1951 model series have appeared in the past few days. Chevrolet's new cars carry a longer, lower look—new rear fenders helped do it. Self-energizing brakes are offered. The company will have built 300,000 Powerglide automatic transmissions in 1950; plans call for doubling this capacity limitation next year.

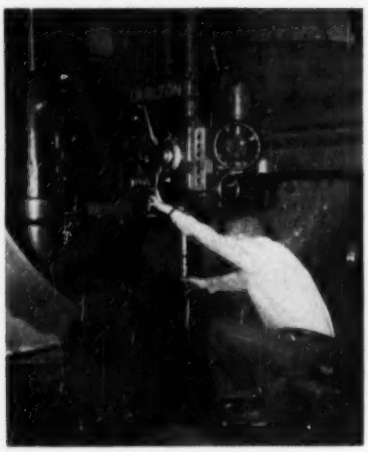
Pontiac's 1951's are, like most of the other new cars, face-lifted and no more. There's a new grille, 26 other styling changes, 16 routine mechanical changes—the most noteworthy being a lengthening of the rear springs by 6 in.

Buick, whose GM family offering is due a little later on, plans to enlarge capacity for 1951 with a new foundry at Flint. The plant will nearly double present casting capacity. This is in addition to the recently-announced 666,000-ft. addition to manufacturing plant facilities at Flint.

COMING AND GOING, this is what the new Chevrolet sedan looks like. The 1951 line includes 14 passenger body types. Principal changes: Radiator grille restyled and simplified; crown of rear fenders raised, and fenders have combination stop and tail light; new "Jumbo drum" brakes, self-energizing in both forward and reverse travel, require 25% less pedal pressure; increase in steering gear ratio. Standard engine develops 92 hp; optional engine available on De Luxe models with Powerglide transmission, develops 105 hp

BIG BORING JOBS . . .





. . . CALL FOR CARLTON RADIALS

Drilling holes in this 9-ton 9-ft. diameter butterfly valve for the Newport News Shipbuilding & Dry Dock Company is a routine assignment for this Carlton 4-A Radial Drill. In spite of the gigantic proportions of this casting, the Carlton Radial drilled it quickly, efficiently and accurately.

For the large boring and drilling jobs—and for the smaller ones, too—manufacturers all over the country have come to rely on Carlton performance. For only Carlton Radials give you *all* these advantages: Centralized push button control, all ball bearing construction, low-hung drive to spindle, modern lubrication, individual unit assembly construction, and many others.

Why not get the "hole" story . . . . write today for descriptive bulletin.

THE CARLTON MACHINE TOOL CO.
CINCINNATI 25, OHIO

THE CARLTON MACHINE TOOL CO.

Machine Tools

Orders still are pouring in for machine tools, but November volume is estimated to have been slightly off from October. Inquiries and known tooling programs ahead foreshadow no appreciable let-up in bookings for some months.

Best guess for 1951 is that machine tool shipments will be around $600 million or about double this year's dollar production. Incoming orders the next 12 months should come close to shipments.

• • •

DO orders are slowly but steadily gaining in ratio to total machine tool bookings. But situation is very spotty. One builder, for instance, has DO orders equal to 35% of total orders not counting sizable British orders. Another, by contrast, has less than 5%.

• • •

Shipments of machine tools in November did little more than equal October's. And December may not do much better. Causes: (1) Difficulty of getting needed manpower, (2) shortage of materials and component parts. Many machines are not being shipped because they are waiting on assembly floors for one or two vital parts, such as bearings or electric units.

• • •

Much of new machinery for defense purposes will be owned by Uncle Sam. A large company in aircraft industry figures that three out of four of the machines it has ordered and will order the next six months will be financed by armed services. Its case is typical.

Ford is making rapid progress with engineering and tooling plans for its Chicago aircraft engine plant. It already has placed some orders for machine tools. Total outlay for tools, dies, jigs, fixtures and machines is estimated at $127 million. About one-half will go for machine tools.

• • •

Decision on priorities for materials and component parts for machine tool industry has been deferred indefinitely by General Harrison, administrator of NPA. He has the matter "under study," but there is little reason to believe that action will be taken for at least 30 days or longer.

• • •

First diversion of a machine tool from non-defense to defense customer has been made. Atomic Energy Commission has taken a 100-in. boring mill just completed for an Italian buyer.

• • •

British have doubled their purchases of U. S. machine tools for armament factories. They now have bought $40 million of an ultimate $120 million. They are getting quotations on remainder.

In their mammoth tooling program, British are using this procedure: (1) see whether they can get required machines in England, (2) if they can't, try to get machines on the Continent, and (3) as final resort, place orders in United States. On this basis, they have contracted for large number of automatic lathes in Germany.

DO ratings for British machines will be requested of NPA as soon as British give detailed data as to what U.S.-built machines are to be used for.

• • •

Norwegians have mission in this country which probably will buy machine tools for at least one ammunition plant, and perhaps two. Transactions will total several million dollars.

NEW MACHINE TOOL ORDERS UP OVER PREVIOUS MONTH

New Orders (Total)	Foreign Orders (included in total)	Shipments (Total)
Oct. 1948	67.4	14.0	80.4
Nov.	72.2	18.1	76.2
Dec.	76.7	16.2	96.9
Oct. 1949	56.8	13.7	62.3
Nov.	84.3	17.0	67.6
Dec.	82.5	22.4	75.7
1950			
Jan.	99.7	26.7	52.8
Feb.	89.2	18.8	56.1
Mar.	107.4	24.9	75.3
Apr.	98.9	17.4	61.6
May	116.4	18.4	82.5
June	124.1	23.0	91.9
July	253.1	22.3	68.3
Aug.	305.1	34.2	95.7
Sept.	280.6	27.2	101.6
Oct.	p290.5	p48.8	p101.1

Data: NMTBA p — Preliminary figures

WHY YOU SHOULD USE SUNDSTRAND "ENGINEERED PRODUCTION" AND EQUIPMENT FOR . . .

Above, typical work parts run over Sundstrand Rigidmil with general purpose magnetic fixture. Lot sizes of parts range from 1 to 25 pieces.

1 GENERAL PURPOSE MILLING

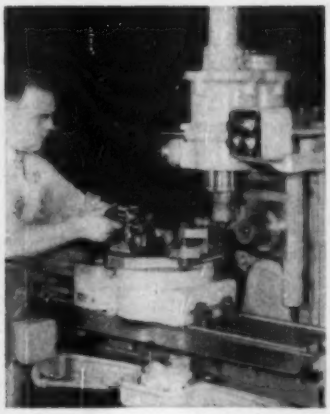
Here's an excellent combination for increasing production and cutting costs on miscellaneous milling. It consists of a Sundstrand Model 33 Rigidmil equipped with a Sundstrand Magnetic Fixture. Parts machined include tool blocks, cam bars, tool slides, motor brackets, etc. Lot sizes vary from 1 to 25 pieces, and time reduction averages 50% over former method.

In addition to saving time through the elimination of mechanical clamps, these magnetic fixtures save the costs of special jigs or fixtures. Install a combination like this and you'll be surprised at the number of different parts you'll be able to mill faster and better. Call in a Sundstrand methods engineer. He'll be glad to help you.

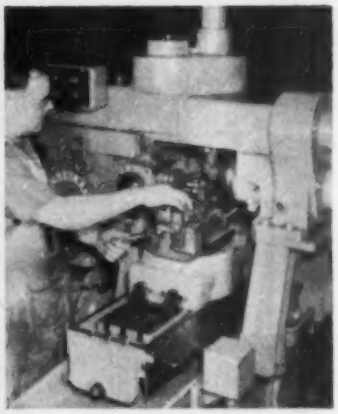
SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Standard No. 0 Rigidmil with 2 magnetic fixtures. Part is rough milled on one side in first fixture and transposed to 2nd fixture for milling opposite side. Production is approximately 170 pieces per hour.



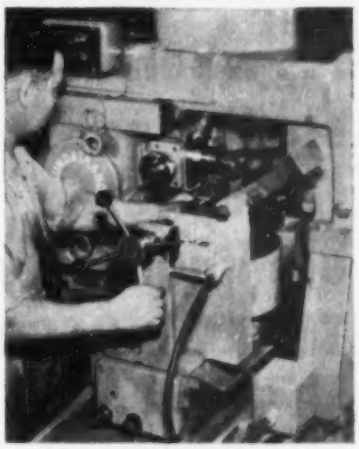
Sundstrand No. 1 Rigidmil with a special 2 spindle head. Two right angle surfaces machined on cast iron compressor part at production rate of approximately 150 pieces per hour. Use of automatic index base makes it possible to load at one station while milling at opposite station.



Standard No. 1 Rigidmil with special 3 spindle head for milling 3 sides of a cast iron compressor part. Machine has two work-holding fixtures mounted on an automatic index base. Three sides of part machined in each machine cycle at rate of 178 pieces per hour.

2 PRODUCTION MILLING

Here's and entirely different approach to a milling problem. Production requirements on these refrigerator compressor parts are over 100 per hour. Consequently, the Sundstrand Rigidmils are tooled up with special fixtures and, in some cases, with special milling heads. Production milling problem solutions like these are the result of Sundstrand "Engineered Production". This service consists of designing the most profitable processing method first, then obtaining machines to suit this method . . . standard or semi-standard machines, if possible, or entirely special machines, if necessary. The machines illustrated on this page are all standard or semi-standard Rigidmils tooled up for special production.



Standard No. 1 Rigidmil with special three spindle head for milling three sides of a cast iron compressor cylinder head. Machine has two work-holding fixtures mounted on an automatic index base. One part is machined with each cycle of the table at a production rate of 145 pieces per hour.

Get this FREE Additional Data

For complete information on Sundstrand "Engineered Production" including specific tooling and production data, write for Bulletin No. 102. For more information on Sundstrand Magnetic Fixtures, ask for Bulletin No. 102M.

SUNDSTRAND MACHINE TOOL CO.

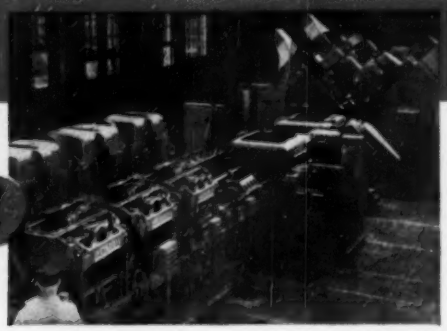
SUNDSTRAND

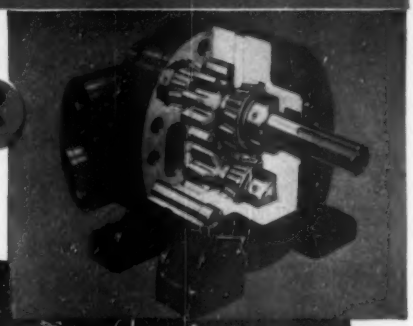
MACHINE TOOL COMPANY

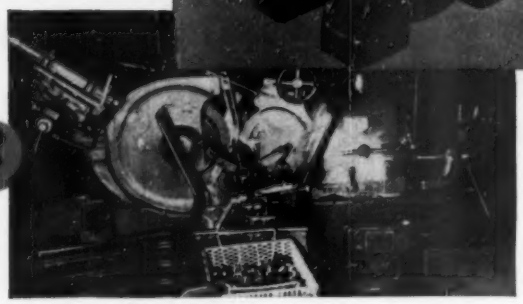
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

3 EXAMPLES OF SAVINGS in Hydraulic Operation







. . . when rust, sludge and foam were eliminated by TEXACO REGAL OILS (R&O)

When *Texaco Regal Oils (R&O)* replaced other brands in the following hydraulic operations, this is what happened:

1. *Customer #1*:* Saved more than $2,000 a month in the operation of five Ingersoll process milling machines.
2. *Customer #2*:* Saved in one year in just one aluminum die casting machine: 1,800 gallons of oil, $350 in pump repairs, produced an additional 50,000 castings.
3. *Customer #3*:* Reduced hydraulic oil consumption 74% on some 80 hydraulically operated machines.

Everywhere, *Texaco Regal Oils (R&O)* assure smoother hydraulic operation, longer pump life, less machine downtime, lower maintenance costs. These turbine-grade oils are specially inhibited and processed to eliminate rust, sludge and foam. They *keep systems clean!*

Let a Texaco Lubrication Engineer help you gain similar cost-saving results in *your* plant. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

*Name on request

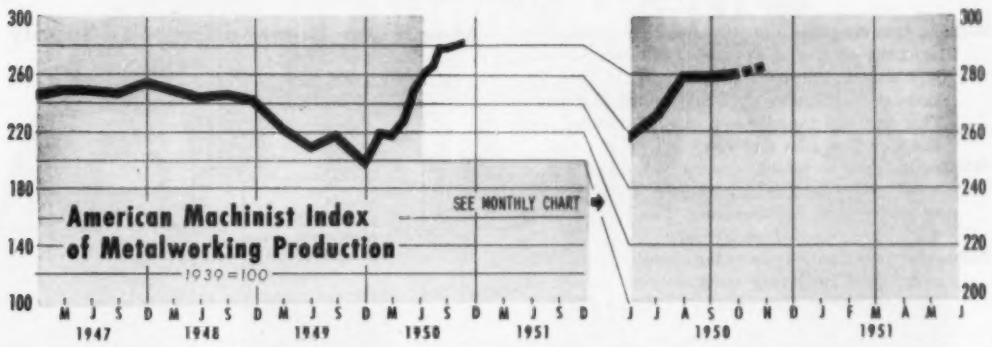
TEXACO

TEXACO Regal Oils (R&O)

FOR ALL HYDRAULIC UNITS

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

Gaging Metalworking



Materials Shortages Hold Back Production

Though metalworking operations this month are likely to match November's, they probably won't be any higher. Already production is using all available raw materials.

Little if any steel, for instance, is going into inventories. In fact, pipelines are almost empty. And that poses the big problem for 1951.

• • •

Washington reports that less raw materials will be available to be chewed up early part of next year than in same period of 1950. That is because fabricators will have only incoming tonnage to draw upon. Lately they have been eating into inventories as well.

Cuts in use of aluminum, copper and other materials will take effect January. And output of consumer goods will be curtailed. General Electric, for one, has announced an across-the-board slash of 25% in all appliance production, effective next month.

• • •

Defense activities, meanwhile, are not likely to expand rapidly enough to take up the slack. Most of spending thus far has been concentrated in aircraft and electronic lines. It has not been spread enough to make much general impact in metalworking.

More and more metal fabricators, however, are scouring the armed services and prime contractors for defense work to fill up the anticipated gap when civilian production is limited. To illustrate: One important company is out to get enough war business to fill up 20% of its facilities. Its present defense work amounts to 7%.

Farm implement manufacturers will be running at full capacity for many weeks, using steel and other materials accumulated during strike periods.

Manufacturers of all sorts of industrial machinery are booked months ahead. Electrical goods—turbines, transformers, motors, lamps—are in top demand. Auto production will slide somewhat this month, with total assemblies for 1950 put at 7½ million units.

Though Metalworking may experience some dislocation as a result of shift into partial war economy, unemployment will be light and temporary. Defense industries and those closely allied will gobble up most of workers the minute they lose their jobs in civilian goods plants.

American Machinist's index should stay in the 275-to-300 range the next few months, as things now are shaping up. November figure is estimated at 283 (with 1939 as 100).

INDEX

	NOV. '50	OCT. '50(p)	SEPT. '50(r)	OCT. '49
	283*	**281**	**279**	**216**
Machinery		**254**	**249**	**199**
Electrical Manufacturing		**325**	**323**	**241**
Automobiles, Trucks		**259**	**258**	**203**
Transportation Equipment		**277**	**288**	**231**
Other Metalworking		**307**	**307**	**229**

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

*Estimated (p) Preliminary (r) Revised

Gaging Business

Defense spending has got off to a slow start. Not until the middle of November did defense outlays outrun those of a year ago. In fact, up through September they fell behind last year. This lag has toned down price inflation. But don't let that fact fool you.

Wholesale prices, which moved sideways for a month, are heading higher again. They climbed to a new peak in November. The level now is 9% above pre-Korean average.

Industrial prices have been rising steadily since mid-year. Cost of living continues to go up. It reached a new high point of 174.8 in October.

• • •

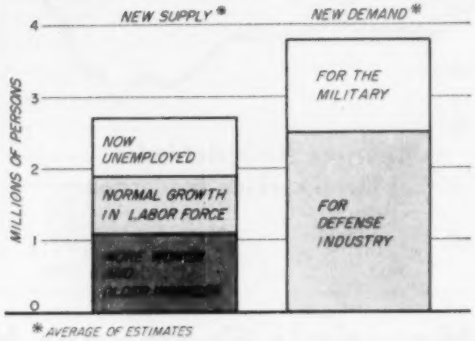
More and more wages are pouring into hands of metalworking plant employees. The Big Steel settlement put the seal of approval on fifth-round increase which will set the pattern in steel and perhaps other segments of metalworking not yet affected.

Wages are going up too under pressure of competition for existing labor. Take-home pay, thanks to overtime as well as wage boosts, reached $61.89 in October.

Armed services are expected to drain 100,000 men a month from industrial labor force in 1951. About one million workers will have to be drawn from non-essential industries. (See chart).

Metalworking will feel impact of defense program much more than indicated by ratio of defense business to gross national product. United States may be in a 10% war, but in 1941 a defense activity which took 10% of GNP showed up as 20 to 25% on Federal Reserve Index. At height of World War II, when 42% of GNP was going into war, it represented 70 to 75% on Federal Reserve Index. Ratio is even larger for durable goods.

Manpower Demand Exceeds Supply



* AVERAGE OF ESTIMATES

• • •

More than $8 billion has been contracted for by Defense Department for supplies and equipment last four months. One-half is aircraft.

Effect of stiffer credit terms (Regulation W) is not as bad as outcries from dealers indicate. Example: After a decline in October, passenger car sales picked up in November.

Federal Reserve Board guesses that consumer spending for durable goods will be down $2.5 to $3 billion next year because of credit curbs.

Tightening of credit is hurting small independents more than big manufacturers. It's easy to explain. Little fellows, in many cases, don't have "product prestige," hence they give more liberal credit than their large competitors.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	222.3	220.9	183.2
Steel ingot operations (% of capacity)	102.7	102.7	87.7
Electric power output (million kilowatt hours)	6,508	6,728	5,537
Production of automobiles and trucks	120,134	125,970	76,026
Engineering construction awards (Eng. News-Record—millions)	$260.3	$235.1	$219.6

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production* (1935-1939 = 100)	211	209	174
Index of durable manufacturers' production* (1935-1939 = 100)	250	247	199
Durable goods manufacturers' sales* (millions)	$9,494	$10,060	$7,335
Electrical machinery manufacturers' sales* (millions)	$1,117	$1,129	$759
Other machinery manufacturers' sales* (millions)	$1,507	$1,554	$1,130
Durable goods manufacturers' sales* (millions)	$11,560	$13,863	$7,099
Electrical machinery manufacturers' new orders (millions)	$1,417	$1,572	$768
Other machinery manufacturers' new orders (millions)	$2,017	$2,197	$990

* Seasonally adjusted.

NEW

Non-Electric MAGNETS
Completely Riveted by
T-J RIVITOR

AUTOMATICALLY FEEDS AND SETS SOLID RIVETS

SAVES LABOR, CUTS COST!

This new "Atomagnet" manufactured by Eriez Manufacturing Co., Erie, Pa., has a completely riveted housing . . . with T-J Rivitors doing the job!

The new product is a non-electric Alnico plate magnet for separation of tramp iron from materials in process. The "Atomagnets" are characterized by great magnetic strength for their size—and light weight. The magnet castings are fully encased with a formed cover —and this aluminum housing is assembled with parts *riveted* rather than bolted together for *added structural strength.* Warping and bending of large size magnets are eliminated.

On countless assembly jobs today . . . T-J RIVITORS do the rivet setting *faster and better!* T-J feeds and sets solid rivets *automatically* . . . no manual rivet handling . . . easy for women operators. T-J produces a solid rivet joint of 10% to 15% greater strength—a completely filled hole . . . no flashing . . . a neat balanced head. Handles many types of rivets. Rugged construction . . . T-J dependability. Write for bulletins 646 and 847. The Tomkins-Johnson Co., Jackson, Mich.

AIR POWERED for aluminum alloy rivets up to ¼" diameter or steel rivets up to 1/8" diameter, up to 3/4" long . . . . . ELECTRICALLY POWERED for 1/16" to 1/4" diameter solid steel rivets up to 7/8" long. Throat depths, 8" to 36".

33 YEARS EXPERIENCE . . . T-J

TOMKINS-JOHNSON

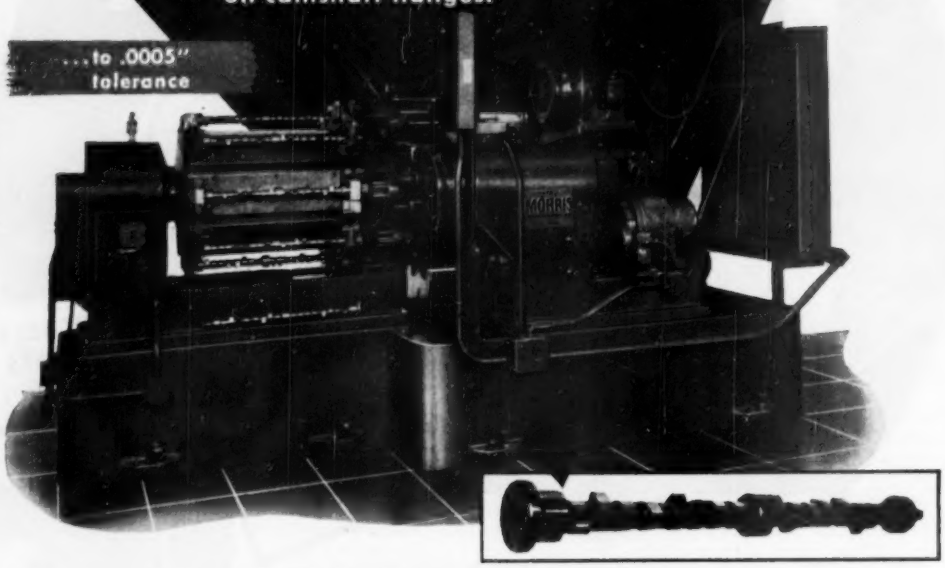
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHERS

Accuracy plus Speed

MORRIS *Mor-Speed* MACHINE performs 16 machining steps on camshaft flanges.

... Production rated: 200 pieces per hour

...to .0005" tolerance



There's no secret in the amazingly high production records set by MORRIS *Mor-Speed* Machines. Each one produces faster, with micrometer accuracy, more parts at lower cost . . . because it's designed for the specific job. Yet their cost is low, compared to ordinary "special purpose" machines, because each comprises many standard parts, engineered to do the special job.

Four holes on the flange of each of eight precision camshafts are drilled, reamed, counterbored and tapped on this MORRIS 8 Station Indexing Machine. Work pieces are indexed to the hydraulically operated head by means of a Geneva cam mechanism. The lead screw feed tapping head is driven independently by a reversing motor. Eight hand clamp fixtures hold the work pieces. Production is rated at 200 pieces per hour at 80% efficiency.

MORRIS High Production Machines save space, time and costs for leading manufacturers the nation over. If you have multiple drilling, reaming, tapping and boring operations on a mass production basis, ask Morris Engineers for a no-obligation estimate of savings possible on your specific jobs.

THE MORRIS MACHINE TOOL COMPANY

"A better product at less cost— with MORRIS ENGINEERED PRODUCTION"

Builders of MOR-SPEED Line

933 HARRIET STREET CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

How To Avoid Austerity

The British have put up with "austerity" for years. Because of a poverty of goods, they have had to deny themselves many of the comforts of life.

Now we hear talk that we may be compelled to adopt an austerity program. The reason is simple. We've got to have more guns. To secure them, we must do without some butter.

As matters stand, that is the fix we are in. There is a growing shortage of many raw materials — steel, copper, aluminum, zinc, tin, cobalt, nickel.

When there aren't enough materials to go round, prices inevitably rise, as they already have. As shortages slow production of end products, and demand outruns supply, prices all along the line shoot up.

We have only one recourse, then, for the short term: to ration materials to serve best the national interest. That is easy to say, but hard to do. Rationing gets tangled up in red tape. It tends to put the economy into a straight jacket. It involves use of controls which Americans instinctively dislike and distrust.

Surely we as a nation cannot be content with this makeshift procedure for long. If we are to accept it over a period of years, while we build and maintain our defenses, we are in for austerity in a big way.

And let's not fool ourselves. No matter how palatable you try to make it, austerity spells a lower standard of living for everyone. What could delight the Kremlin more than to have us slip into a lower standard of living?

Only one course of action is open, if we are to avoid austerity except on a temporary basis. We must expand with all possible speed our facilities for producing raw materials and securing them from other countries.

At the same time, we must make sure that we have enough fabricating plants to turn out a larger volume of goods when more materials are at hand.

The task of recruiting the work force necessary to carry out this program will be tough. But it is not impossible. A further increase in the use of machines and mechanical aids of all kinds will help tremendously in expanding the output of every worker.

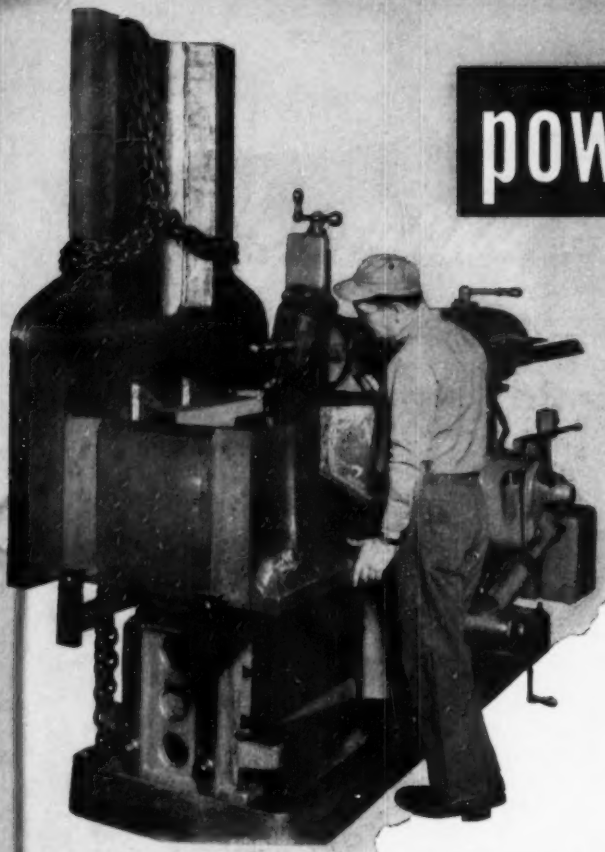
More production is what the country needs and must have, unless we are willing to settle back and complacently accept austerity. We must pour out of our factories more and more goods of all kinds for defense and civilian purposes.

Such a flood of production will do wonders in keeping inflation within bounds. But it will do more than that. It will confound our enemies and delight our friends, as in World War II. It will enable us to have both guns and butter and thus will save us from austerity.

Burnham Finney

EDITOR

powerful!



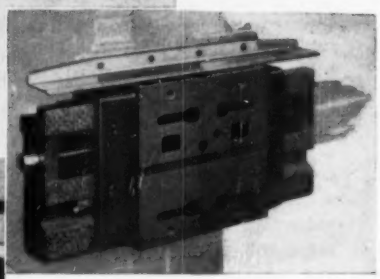
Jobs like this 5300# weldment are easy on a Cincinnati

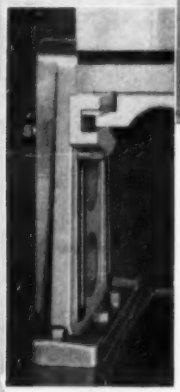
Cincinnati Shapers are powerful and dependable...

Cincinnati Shapers handle very heavy work—are powerful metal removers. They are dependable and trouble free on the most demanding jobs.

The extra long feed of the Cincinnati tool slide gives the needed range to shape the long blind hole of this large weldment. Dovetailed tool slide and accurately gibbed ram, with extended bearings, prevent chatter under these severe conditions. Table feed and power rapid traverse operate smoothly even with this 5300-lb. load.

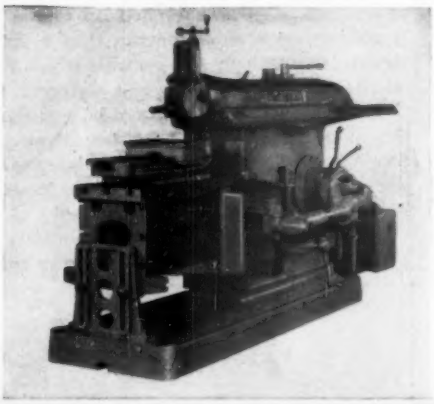
Cincinnati Shapers work to close limits and are profitable in both tool room and production departments.





This massive cross rail securely supports the apron on three automatically lubricated bearing surfaces. All controls are at the operator's position. The cross rail is square-locked to the column and automatically lubricated. Alignment is maintained by taper gibs.

This sturdy table support has the sliding action at the table and is gibbed to maintain alignment. Sliding surfaces are completely protected against dirt.



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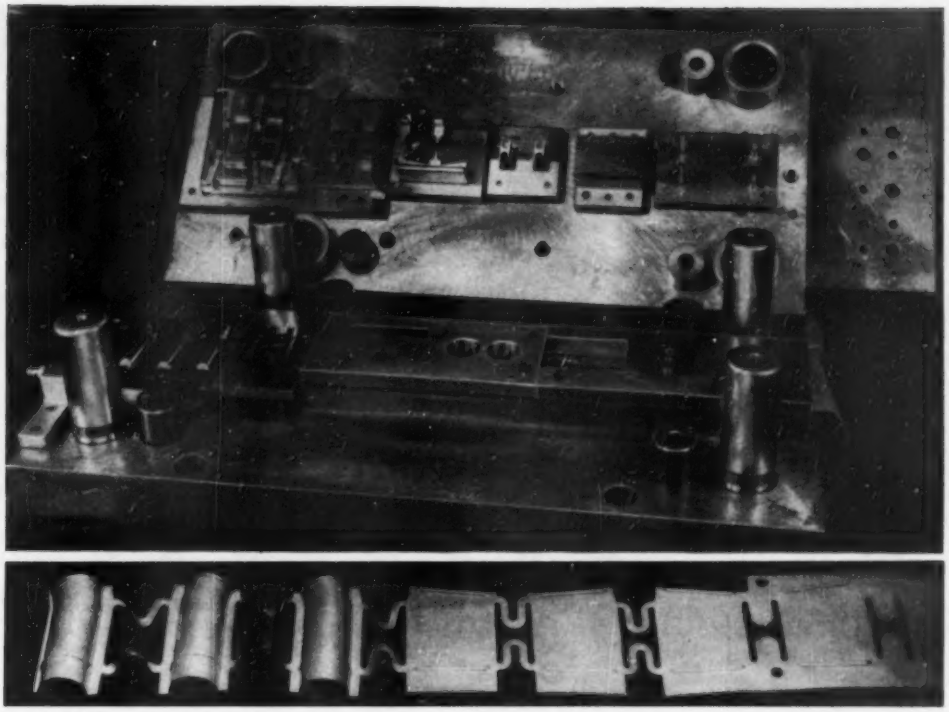


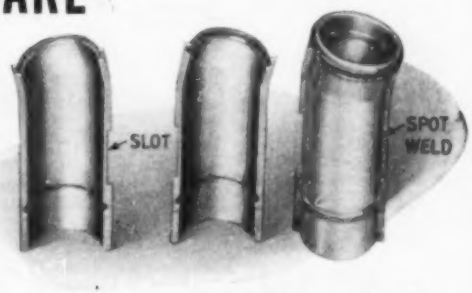
Proper location of half-collar blanks at the forming station must be secured without changing the lead. Three pilots at the forming station hold the blanks so that the strip cannot be pulled in. Bridge suspension members stretch and curl into clearance spaces purposely provided in die and punch members

PROGRESSIVE DIES MAKE PRECISION TV PARTS

BY RUPERT LeGRAND, Associate Editor

Cost of some television parts has been reduced as much as 75% in the last year through replacement of short-run tooling with precision-made progressive dies. Of the dies built and used by John Voelkert Metal Stampings, Inc., Queens Village, L. I., two are outstanding with respect to number of operations performed.

Stainless steel collars are required for the electron gun of the television picture tube. These tubular parts are bent at one end and must be precision-made to avoid distortion of the electron beam. Tubing is commonly used, and one end is edge rolled. Voelkert cut part cost by designing a progressive die to produce right- and left-hand



Slot in stainless-steel half collars must be located accurately with respect to angular end and centerline

half collars with the offset formed in place, and side flanges that are spotwelded. With every press stroke, a pair of collars is produced from Type 305 stainless strip of soft grade—90,000 psi. The strip has a thickness tolerance of ± 0.0007 in. and is 0.010 in. thick by 1¾ in. wide. The Bliss No. 103 press operates at 85 strokes per min., and a non-sulfurized, mineral-lard oil is used on the strip.

A seven-stage progressive die is required for making half collars for a specific reason: To assure accurate location of the slot in one flange. It was decided that a developed blank could not be depended upon to give the desired results in a combination blanking and forming die. Hence, the slot is left to the last operation and is blanked at the same time the scrap is removed.

Details of the operation are:

Station 1 — Pierce two holes for piloting. Two of the three die bushings are sufficient for running the wide strip. If a narrow strip is to be used for a shorter half collar, the upper and center bushings are used. The bridge suspension holding the parts in the strip is purposely offset to accommodate narrow strip without changing many die details.

Station 2 — Pilot in the two pierced holes.

Station 3 — Form the ribs on two blanks.

Station 4 — Blank an H-shaped opening that becomes the center of the scrap suspension that carries the piece during forming and trimming.

Station 5 — Trim an 11° angle on the end of the blank and the outside of the suspension. Two trimmed blanks are now ready for forming.

Spring pins are used in piercing and trimming punches to be certain that scrap is pushed down. This is a very important feature of such tools, because otherwise odd-shaped slugs might be carried along with the strip and cause damage to the die.

Station 6 — Form half-round collars with side flanges. The forming members are built up in sections, with washer-like inserts to restrike the ribs and avoid losing relationship of rib location and angle.

Forming the blanks stretches the suspension, which is designed so that the remainder of the strip is not distorted and the lead is not disturbed. This is accomplished by three form-ground pilots at station 6. All of these pilots bear against the blank or shell and the end of the suspension. Front-to-back location is likewise secured.

The pilots operate in this manner (assuming two trimmed flat blanks have been fed over the forming station):

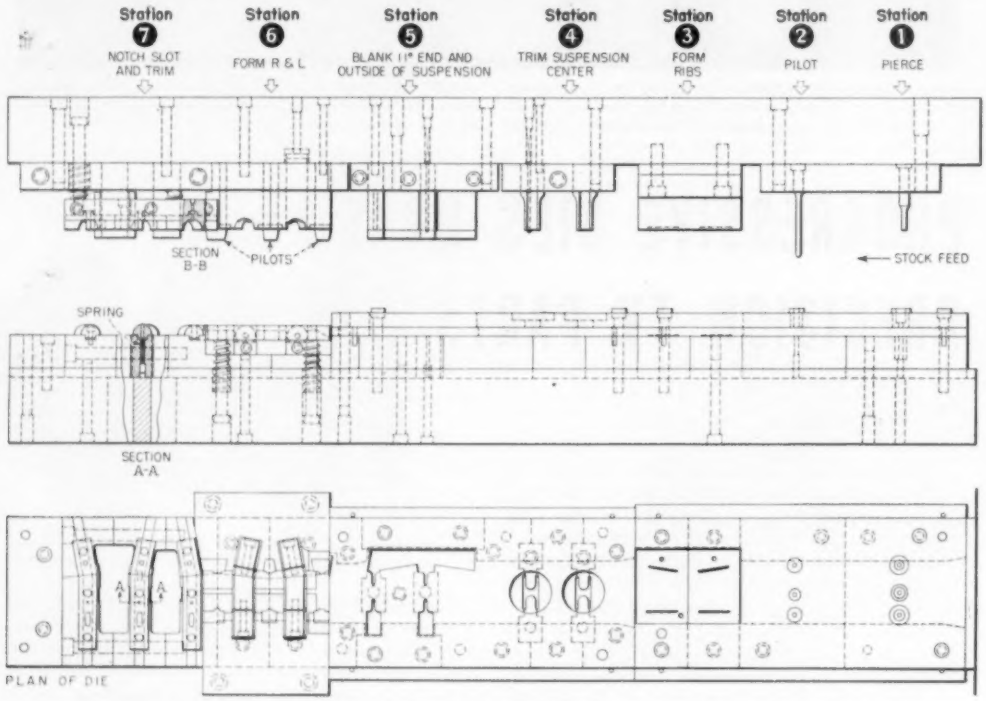
Pilot 1 bears against the trimmed suspension at right of second blank.

Pilot 2 bears between the two trimmed blanks.

Pilot 3 bears between the last trimmed blank and the adjacent formed shell.

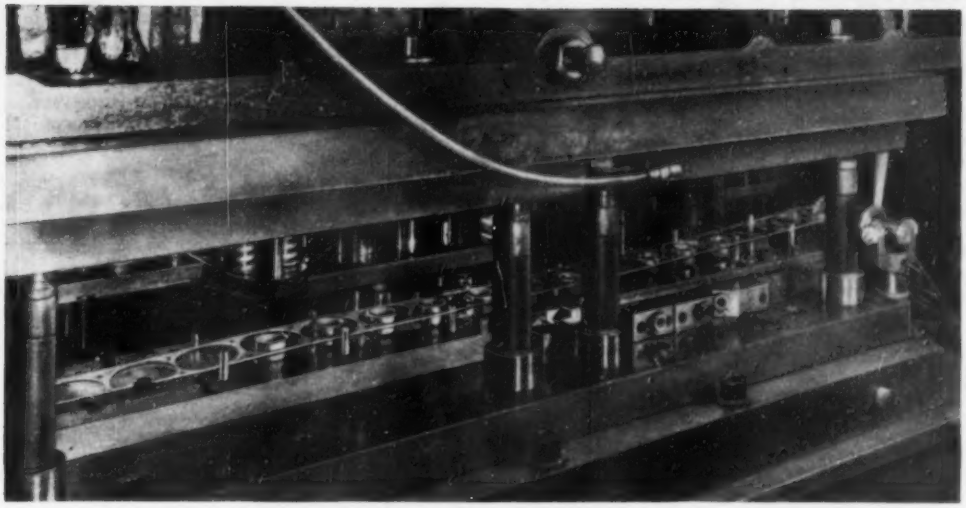
When the punch descends, pilot 1 prevents the strip being pulled in. Pilot 3 prevents the formed section from pulling back. Pilot 2 locates the flat blanks over the forming stations. Thus, the three pilots act like a nest.

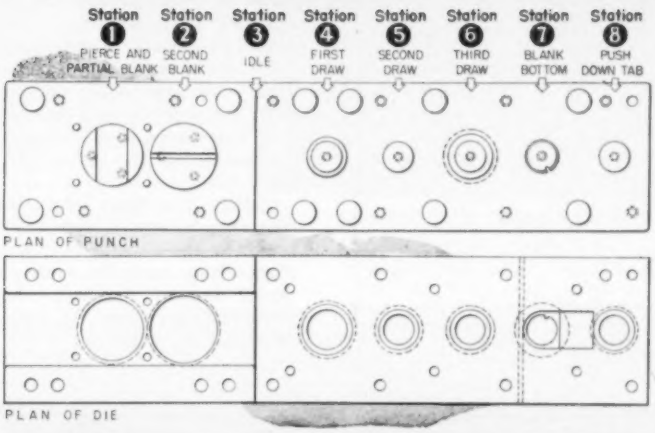
The suspension is allowed to dis-



7-STATION COLLAR DIE

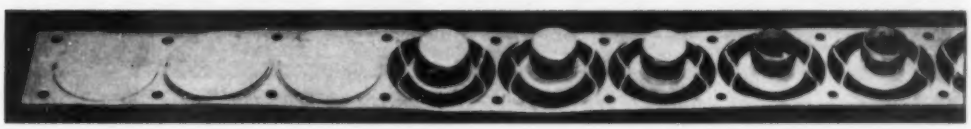
Dies sections in tool for stainless-steel half collars are set into a slot in the dieset base, in order to prevent spreading or shifting. Stock guides are located by small pins and held by screws in 1/32-in. oversize holes. Thus, guides can be reground in case of wear, and reset or repositioned if stock varies in width





15-STAGE DIE FOR BRASS SHIELD BASE

A high-production die is required in order to produce an accurate part at low price. One large dieset contains two diesets in tandem. One dieset performs the drawing operations, the other is equipped with cam dies for various forming and piercing operations on sides of the part. At left are plan views of the punch and die members for partial shearing of blank from the strip and the drawing steps



tort freely, and added stiffness is gained by twisting of the suspension members.

Station 7 — Blank down scrap, trim notch and blow off shell. Three removable nests on the die member locate the blanks leadwise. Pilots in spring strippers on the punch member locate the shells front to back. The first punch trims the inside of two blanks, and the second punch trims and notches the outside of two blanks.

Shield Base Requires 15-Stage Die

MORE THAN 2,000,000 brass shield bases have already been produced in a 16-stage die that John Voelkert Metal Stampings designed and perfected. In this case, the strip is advanced from left to right, since the Dickerman 4-in. feed is operated by a cam mounted on the press slide. A scrap coiler at right of the Bliss No. 104, open-back press is equipped with a weight to place just the right amount of tension on the scrap strip to pull it through the dies properly and hold it level. The dial operates at 65 strokes per min., and produces about 500,000 pcs per over-all grind.

The 0.014 in. thick (± 0.001 in.)

x 2 in. wide brass strip passes through a die that is essentially two dies in tandem, each being set up in its own 4-post dieset. In the first stage, blanking and drawing operations are performed; in the second stage, various forming and piercing operations are done, mostly with cam-operated side punches.

Again the part is carried along in a bridge suspension. Sequence of operations in the first half of the die is:

Station 1 — Pierce two holes for piloting during feeding for blanking, and partially blank the round blank for the cup, leaving opposite small tabs for carrying purposes.

Station 2 — Pilot and second blank along two arcs concentric with but of larger radius than the first blanking operations. The blank is now retained by narrow circular strips.

Station 3 — Idle to give room for a heavy draw pad for subsequent operations.

Stations 4, 5, and 6 — Cup, redraw and square up bottom corner and draw radius.

Station 7 — Blank out shell bottom, leaving small tab.

Station 8 — Push down tab to alignment with shell wall.

Forming Operations

Station 9 — Pierce opposite windows in shell wall for screw clearance. Pressure pad on punch member holds down the shell while cams operate side punches in die.

Station 10 — Crimp shell wall. Cams operate crimping jaws in die base. Parting faces of jaws meet at windows to avoid marking shell.

Station 11 — Shear tab below each window for screw-head clearance. A spring-loaded, two-step punch enters the shell. Side punches shear against the first punch to shear and form the tab.

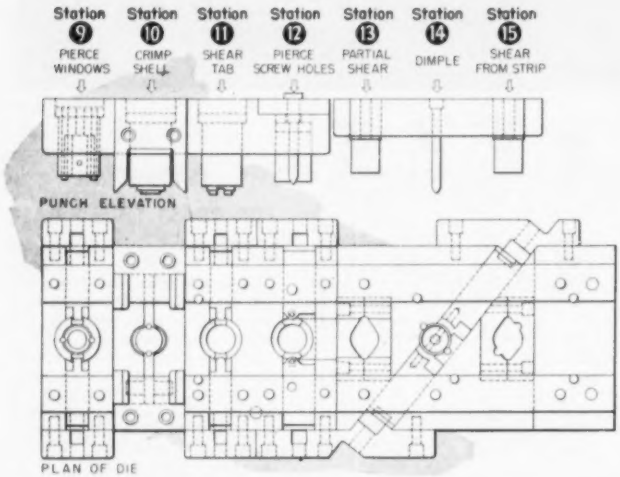
Station 12 — Pierce screw hole adjacent to each tab. Cam-actuated slides in base contain die bushings. Pilots enter the slides to align them, and punches enter the bushings. This construction is essential because the hole lies partly within plane of the shell wall.

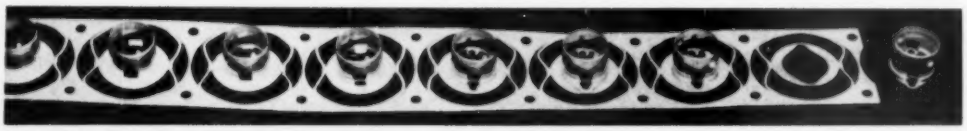
Station 13 — Shear part loose from strip, except for ends.

Station 14 — Dimple side walls of shell from inside. These dimples extend beyond the shear line, which is the reason for partial shearing at prior station.

Station 15 — Blank part down.

SECOND HALF OF SHIELD-BASE DIE





Cam-operated punches are used liberally in order to pierce side windows, form tabs, dimple the shell wall and even to position die bushings on slides for piercing screw holes in the flange of the part. Throughout these stages, as in drawing, the bridge suspension holds the shell without cocking as it is pushed into a die recess

Make The Most Of Your Manpower

"EVEN THOUGH our limited defense program is in its first stages, occupational manpower shortages are already appearing." With this warning, Robert C. Goodwin, U.S. Department of Labor, outlined in a speech before the Society for the Advancement of Management the steps that management should take to make the most of available manpower.

"Employers should study their manpower resources and determine where they can get replacements. Where necessary, they should institute in-plant and outplant training courses for the expansion of skilled manpower. They should work with the local offices of the public employment service. They should let these offices know of their manpower requirements and their problems, and should make use of labor demand and supply reports and other information available there concerning labor market conditions. And finally, industry should make it a matter of policy that local labor supplies be exhausted before raiding other areas."

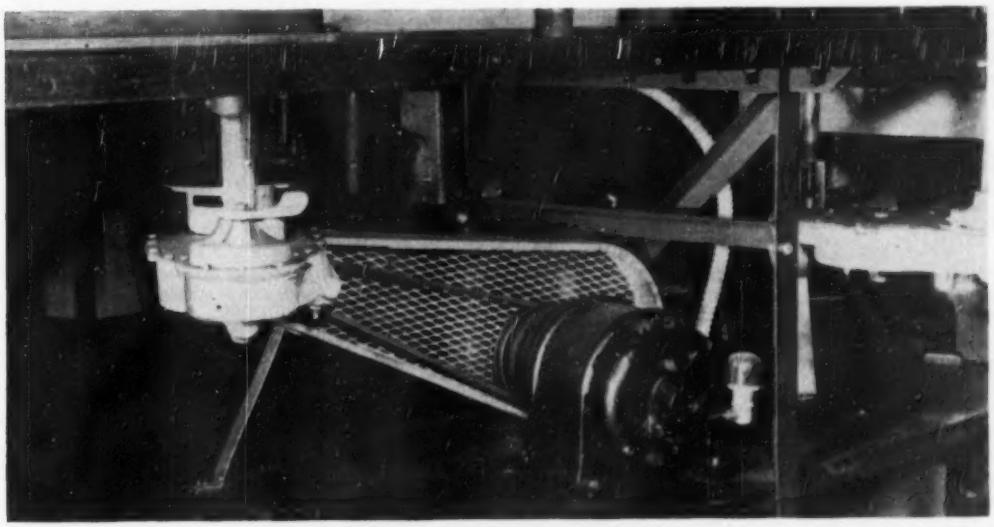
Duz Doesn't Lap — But Washer Drive Does

BY LOUIS GROSS, Machine-Shop Foreman, Vapo-Heating Corp.

A LAPPING bench, rigged up at Vapor Heating Corporation's shop, mass-finishes valve assemblies, 15 at a time, by driving 15 small vertical spindles from a Thor washing-machine transmission. Two long heads hold seven spindles each, and the center drive spindle carries another spindle. Each head is powered from the center spindle by pushing it between two steel guide rails toward the spindle in the middle.

Power is cut off so seven spindles can be reloaded or compound added by pulling a head away from the center spindle. Support for the whole mechanism is a steel plate raised above the bench top so the spindles are at a convenient working height. After a year of constant use, the lapping machine shows no signs of undue wear.

VALVE ASSEMBLIES for railroad-car heaters are lapped on shop-built machine so seats and conical plugs will hold steam at 250 psi. Spindle rotation at 400 rpm is reversed every 10 revolutions. Power is from . . .



THOR WASHING-MACHINE TRANSMISSION, which drives vertical shaft in place of regular agitator shaft. Transmission, in turn, is operated by 1-hp motor and V-belt drive. Lapping compound is 80 fine grit for start, W-440 extra-fine rouge for finish

GOOD CARBURIZING PRACTICE

IV...Gas Carburizing Requires Close Control

Control of the gas carburizing process requires attention to gas distribution within the furnace, the gas pressure, temperature, work loading, gas analysis, and dewpoint

BY T. A. FRISCHMAN, Chief Metallurgist, Axle Division
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Flow of gaseous carburizing medium is important not only in respect to furnishing the current amount of carbon for absorption by the steel, but also the performance of other functions. Gas flow creates a slight positive furnace pressure that is essential to successful gas carburizing. Flow likewise purges oxygen or water vapor that lingers in the furnace atmosphere from opening or closing the doors during charging or discharging sequences. Rate of flow should not be high enough to cause channeling or stratification, nor slow enough as to permit stagnation or pockets.

Freedom from trouble will soon indicate the best gas flows to use for purging and subsequently for carburizing.

Distribution of Carburizing Gas

The distribution of the carburizing gas refers to the various points of admittance to the furnace chamber. Where forced circulation is used, as from a fan, furnace gases pick up or mix with incoming fresh carburizing gas. If forced circulation is not provided or it is accomplished only by pressure of incoming gas, attempts at control of gas distribution are not always successful.

In the absence of forced circulation, orifices of definite size have been installed in the effluent lines to emit certain percentages of spent gas, either at one or the other end of the furnace or possibly at both ends. But, leaks often develop in door seals and allow gases to escape along the path of least resistance. The only solution is to reface the doors or frames or install new ones. Since this step is expensive at times and not always possible for many reasons, the effluent gases do not always travel along their predicted courses. These departures do not seem, however, to be the source of major trouble.

In the early days of gas carburizing, a large percentage of the incoming gas was admitted to the charging zone of continuous furnaces. The purpose of this procedure was to deposit soot on the work to make ample carbon available for the reaction. As time passed, the soot deposit became more of a liability than an asset, because it introduced irregularities into the carburizing process. Modern furnaces introduce carburizing gas at the center and discharge zones, with the intention of sweeping it over the work by movement opposite to work travel. But as mentioned, plans to attain directional flow of gas are not always realized, especially when unforeseen conditions arise.

In early muffle-type furnaces, carburizing gases were admitted at the side or top of the muffles. Currently, gases are mostly admitted along the sides of the furnace, through inlets with fixed-size orifices. The inlets are provided with shut-off cocks to distribute the incoming gases in accordance with best furnace performance.

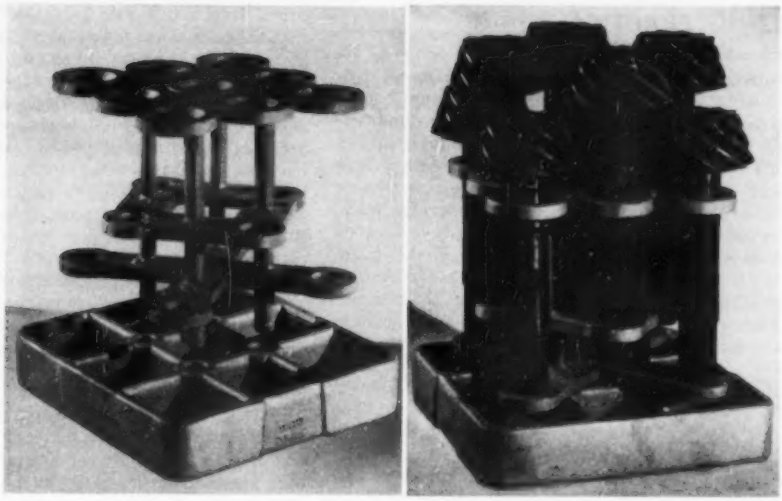
Diffusion

Diffusion in gas carburizing prevents formation of high-carbon concentration in the case where mediums of high-carbon potential are used, or where steels have chemical composition favoring the formation of excess carbides. The method is effective with smaller retort furnaces, but is somewhat difficult to attain in continuous furnaces.

In retort furnaces, incoming carburizing gas can be cut off and the retort capped to confine the carburizing gases therein. This step allows carbon concentration in the case to reach equilibrium with the surrounding gas, and to permit diffusion of the carbon inward through the case, while not building up high carbon at the surface of the steel.

In continuous furnaces an approach to diffusion comes close to realization by the expedient of lowering the temperature at the discharge end of the furnace. By so doing the solubility for carbon by the steel is lowered and the carbon that has already been absorbed can diffuse or progress inward into the case without being increased from the outer surface.

In present-day continuous gas carburizing, the attributes of diffusion are being gained by making sure that the carbon potential of the carburizing medium is not so active that excessive carbon concentrations will build up. As mentioned previously, a common procedure for diffusing in retort-type furnaces is to admit carburizing



Courtesy Electro-Alloys

TRAYS AND FIXTURES are of many designs to suit work characteristics. Left—Fixture and tray into which it fits. Right—Assembly loaded with nine automotive drive pinions

gas in the form of natural gas for the first two-thirds of the cycle and then close off both inlet and outlet points of the carburizing gas during the last third.

Diluent gases reduce activity of the carburizing medium. Carrier gases can also be classed as diluents, but actually there is a distinction between the two terms. "Diluent" implies weakening or thinning out, whereas "carrier" implies a vehicle or conveyance for the carburizing gas. For instance, two parts of air to one of propane can be considered a diluent just the same as when equal parts of flue gas or exothermically produced flue gas are mixed with natural gas to form a carburizing medium.

Another important factor in gas carburizing is furnace-chamber pressure. If the pressure is not positive, air will find its way into the furnace to form water vapor or carbon dioxide, both of which are decarburizing agents. General practice is to aim for a furnace pressure of 0.10 to 0.50 in. water column to prevent ingress of contaminants with opening and closing of doors.

Any point of negative furnace pressure will permit entrance of air even though the regular supply of fresh carburizing gases is being admitted. Mixing of air with carburizing gases generally results in a gas of higher specific gravity that lays in the bottom of the furnace chamber. Then carburized articles that occupied a higher position in the furnace oftentimes show no evidence of carbon loss at the outer surface of the case, but those lower in the charge show decarburization.

Decarburization

Decarburization may be defined as loss of, or lowering of, surface carbon concentration below that of the immediate interior portion of the case. It can be of little consequence, or of major importance, depending on whether the part is ground or not after carburizing and hardening. In gear work, decarburization is undesirable, especially where final grinding of the teeth is not performed. Because of lack of carbon and lowered wear resistance, this type of case can be filed sometimes as deep as 0.005 in. Such a condition on a gear-tooth surface cannot be tolerated if good service life is expected.

Means of combating decarburizing tendencies in gas carburizing are many, but the main methods are proper control of the carburizing gases and the prevention of the infiltration of contaminating mediums, such as products of combustion, air and/or water vapor. Air gaps in door openings or around radiant-tube bulkheads, or leaks in muffles, retorts, seals and pressure-type radiant tubes, all contribute their share in causing trouble. Vigilance in spotting these troubles and quickly eradicating them is well repaid in trouble-free operation. A rapid way to detect any such trouble is by making gas analyses. These definitely reveal the presence of these unwanted constituents.

Temperature and Time

Customarily, gas-carburizing temperatures range from 1650 to 1750 F, the average being around 1700 F. Choice of the specific carburizing temperature depends largely upon a compromise between speed of carbon absorption, case characteristics and economy in furnace operation. True, deeper cases for the same time interval are possible but, on the other hand, with temperatures above 1700 F, the deterioration of heat-resisting alloy in the furnace and work-supporting appurtenances is accelerated, thus offsetting any gain made by using higher temperatures.

More often than not, temperatures in the charging zone of continuous gas-carburizing furnaces are set approximately 50 F. below the actual carburizing temperature. The heat input may be cut off or stopped from time to time to avoid excessive heat concentra-

tion at the burners or heating source. In retort-type carburizing it is best to retard the heating rate until the desired carburizing temperature is approached, to avoid precarburizing of parts. Thus, with heat input retarded, more uniform heat distribution within the charge can be effectively obtained.

Time at heat to produce a given effective case depth is a function of the carburizing temperature and the carbon potential of the carburizing medium. Any variance of these two factors will be reflected in the carbon concentration and depth of case.

The literature contains references to formulas and graphs for prediction of carburizing rates. These data are useful if all factors are taken into account. However, a figure that is in common use is approximately 0.007 in. per hr up to 0.040 in. case depth, and diminishing to approximately 0.005 in. per hr upon reaching 0.060 in. These figures are estimates and are to be used for a temperature of 1700 F, assuming the steel has reached the carburizing temperature.

All things being equal, much less trouble of all sorts, whether stemming from either mechanical or metallurgical reasons, will be experienced when the carburizing operation is carried out at or near 1700 F. Some plants purposely drop the temperature of the last zone about 100 to 150 F below the carburizing temperature to develop certain case characteristics when employing direct quenching from the carburizer.

Loading of Work

This phase of gas carburizing ranges all the way from no problem at all to one requiring special fixturing, depending upon the shape of part and type of furnace used. No fixtures are needed with horizontal retort furnaces, where the retort revolves and constantly turns the pieces over and over, or where an internal helical groove moves the workpiece along. The material can be manually loaded or hopper fed. In stationary pit-type gas carburizers, the work is loaded in baskets or on fixtures. Sometimes, auxiliary supports are used, such as posts, horizontal bars, hooks, screens, and separators.

Loading of continuous-type carburizers almost invariably requires special fixtures, such as trays, separators, posts, hooks, crossbars or similar devices to support the work. Proper space allowance between the pieces is necessary to insure free circulation of the carburizing gases, but more so to cause even heating to prevent distortion and also to develop uniform case depth all over the work surface. Separators and other such fixtures also anchor workpieces so that they will not fall off the trays into the path of furnace parts, such as cross-pushers, extractors, ejectors, transfer cars and pusher heads.

These fixtures also separate the work in direct quenching. Good circulation of quenching oil around the part is thus made possible, producing satisfactory microstructure and hardness, as well as freedom from distortion.

Trays and fixtures are of various designs. If workpieces vary widely in shape and size, many kinds of work fixtures will be needed. This constitutes a problem in working out loading combinations to realize good efficiency from the furnace. Other problems are: maintaining a working supply of fixtures of different designs, and storing them either as spares or between use in the furnace. It is in situations like this that pack carburizing becomes attractive.

Carbon Stop-off Poses a Problem

Effective carbon stop-off, or selective carburizing as the term is also known, is difficult with gas carburizing. Copper plating procedures employed for carbon stop-off in pack carburizing do not ordinarily suffice for gas carburizing, unless the quality of the copper plate and its depth are carefully watched. Plating time will average at least four times longer for effective stop-off when gas carburizing than for the pack method.

Explosion Hazards

In connection with gas carburizing, it would be unwise to consider an installation explosion-proof. It is fairly safe to assume that if the furnace temperature is above the ignition temperature of the carburizing gas, and the composition of the gas is as desired, and everything else is in proper order, it is virtually impossible to have an explosion. Notwithstanding all precautions taken, explosions still occur from time to time. Wherever possible, furnaces should embody explosion heads or covers just in case something miscarries.

All large continuous-type furnaces, as well as many small ones, are today wired so that the carburizing gas or its carrier gas cannot be admitted to the furnace unless the furnace temperature is safely above the ignition temperature. Most controls are set to open the gas-atmosphere inlet valve when the furnace temperature reaches 1300 F or higher. Temperature below this value are likely to cause an explosion if some spark or medium of ignition should occur. Vestibules of gas-carburizing furnaces, especially of large volume, should be purged and gas be burning from the effluent pipe and around the door frames before the outer doors close completely.

Control of Gas-Carburizing Process

The simplest method of control over the carburizing process, and perhaps the oldest, is the use of a test piece or test pin. After being carburized with the work, the test piece is broken upon hardening and the case depth read with a Brinell microscope or an indented gage. This method is still much in use. Later, microscopical examination supplemented the test-pin test and next followed the method of the chemical analysis of successive layers down through the case. Recently, the method of using small thickness sheet strips referred to as "carbon potential strips" was developed, and the carburizing efficiency was determined by gain in weight due to carbon absorption.

Any of these methods can be used for pack carburizing and the liquid carburizing methods. Gas carburizing is controlled by other methods; namely, analysis of carburizing gas mixture as well as determining its dewpoint. Where

natural gas is used solely as the carburizing medium, either of the last two methods are used. However, when using other gases, especially of the diluent or carrier type, gas analysis and dewpoint determinations help to keep the process under control, especially in large installations and where certain definite types of case are wanted.

Dewpoint Determinations

With gas carburizing, it is a good plan to control the chemical composition and dewpoint of both the generator gas and the mixture of gas in the furnace chamber. Daily dewpoint determinations and weekly gas analyses are recommended. Some plants do not follow these practices, others will check more often. These practices are a matter of choice, depending on many conditions and situations.

In any event, employing control measures is a lot easier than contending with trouble in the nature of variable case depth, microstructure and work not up to standard. When analyzing the gas, frequently only the carbon dioxide, oxygen and carbon monoxide are determined. These constituents tell quickly in advance whether equilibrium is being maintained between the furnace interior, carburizing medium and part to be carburized. Locations for taking the sample, elapsed time interval after closing the doors, type of sampling tube, conditions of inlet tubes and other such important considerations enter into the control problem.

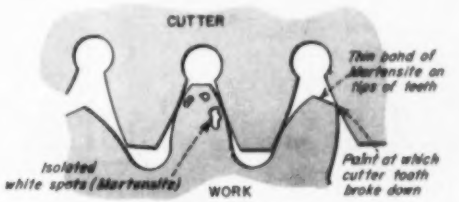
Advantages and Disadvantages

To summarize the gas carburizing process, the favorable factors are: (1) shorter time than pack method for equivalent case depths, (2) carburizing boxes, covers and carburizing compound are not needed, (3) shop conditions are cleaner, (4) quenching of tray loads of materials is permitted instead of individual handling of the pieces, (5) low labor cost, and (6) more positive control of type of case (carbon concentration). In continuous carburizing, the process becomes a more or less production line operation, thus eliminating considerable storage space and repeated handling.

Disadvantages of gas carburizing are: (1) more technical control is required when using mixtures of carrier or diluent gases and hydrocarbon fuels as the carburizing medium, (2) protective atmosphere becomes lost in case of gas-supply failure and to a lesser degree, power failure, (3) furnace must be kept tight and in good state of operation, (4) wide variety of work-supporting fixtures are needed unless parts can be bulk loaded, (5) copper plate for carbon stop-off is less effective than for the pack method, unless greater depth of plate is provided, (6) heat-resisting alloy such as muffles, retorts, trays, fixtures, radiant tubes and furnace parts with tendencies to be porous deteriorate faster due to carbon breakdown from gas to solid after entering the voids. The soot problem on work or deposit within the furnace chamber, even though using clean carrier gases, generally must be considered as another disadvantage. Explosion hazard is ever present, requiring constant vigilance.

Another installment of "Good Carburizing Practice" will be published in an early number.

AVOID COLD-WORKING IN GEAR BLANKS


CUTTER
Thin band of Martensite on tips of teeth
Isolated white spots (Martensite)
WORK
Point at which cutter tooth broke down

A report on gear-shaving experiments by the National Broach and Machine Company points up the importance of careful handling and machining to get away from excessive hardening when gears are shaved.

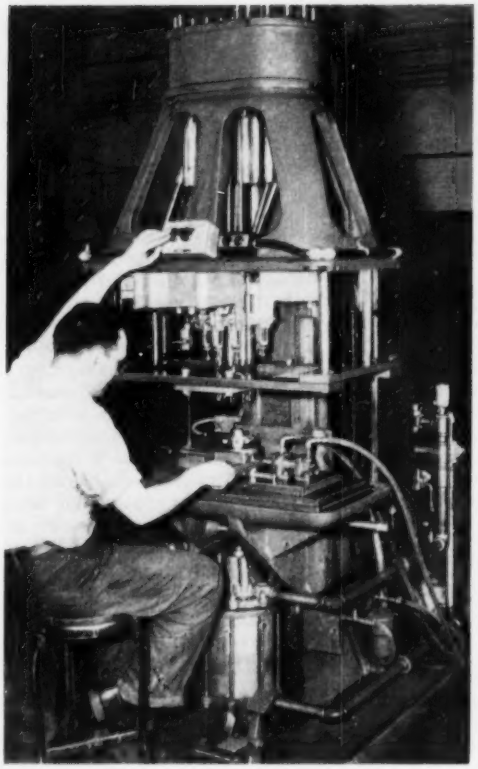
Trouble developed when SAE 1046 blanks, hardened to 30-37 R_c before being turned and cut, started breaking down carbide cutters along the middle of the side profiles of the teeth. This spot (see sketch) is where the sharp edge of the gear tooth turns out as the cutter and gear teeth go out of engagement.

Machinability of steels above 25 R_c is normally poor anyway, and cutter life is short; but neither of these effects should have caused the drastic breakdown of the cutter that was experienced.

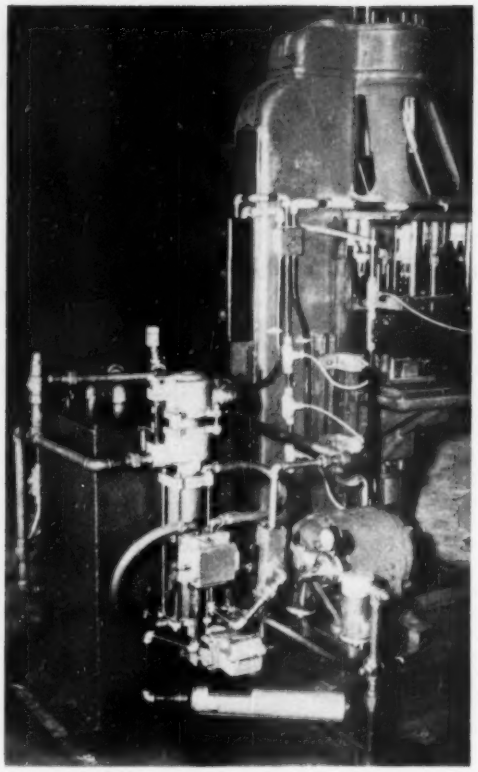
For further investigation, a gear segment was tested in the lab for hardness and microstructure. Hardness was from 37 to 40 R.; and the polished and etched sample showed a white line, 0.006 to 0.012 in. thick, along the profiles of the teeth. Isolated white spots were also seen all over the tooth surface.

The spots were determined to be martensite. Conclusions drawn from the experiments were that excessive heating during the turning operation, followed by instant quenching by the coolant, were hardening the gear blanks. In addition, dull carbide tools were contributing a share of the hardening.

These results show that it is important to avoid heavy machining, to cut hardened gears only with sharp tools, and to avoid heating the work by any means when shaving must follow. In fact, any following machining operation may suffer if these points are not noted.

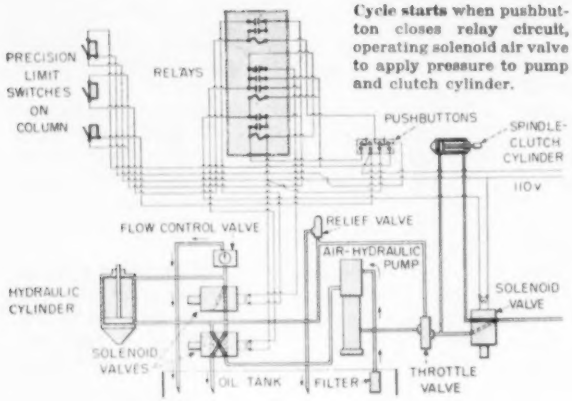


Drillpress with deluxe flourishes has simplified controls. Operator locates work with lever that moves plate gage, then punches start button overhead. Electric devices on the multiple-spindle upright drill do the rest



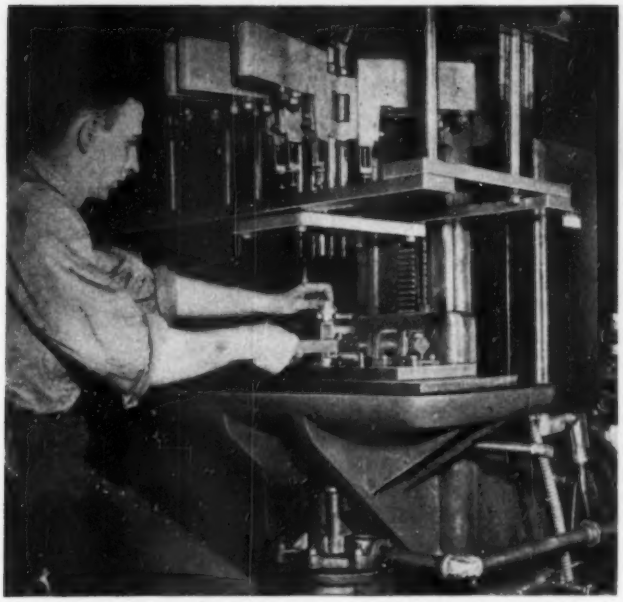
Power assembly is at side and rear of drill. Three precision limit switches on machine column actuate hydraulic cylinder with 10-in. stroke which feeds and returns table. Bottle accumulator provides even pressure

Conversions Tool Drillpress for Small Lots

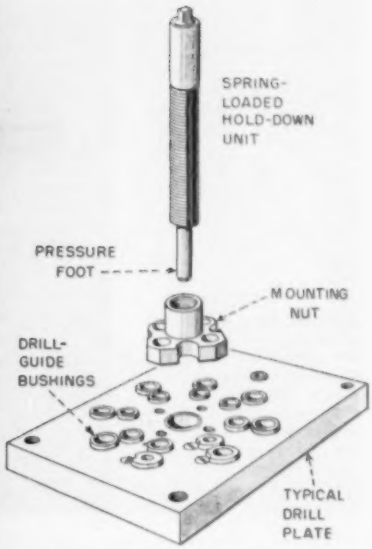


Cycle starts when pushbutton closes relay circuit, operating solenoid air valve to apply pressure to pump and clutch cylinder.

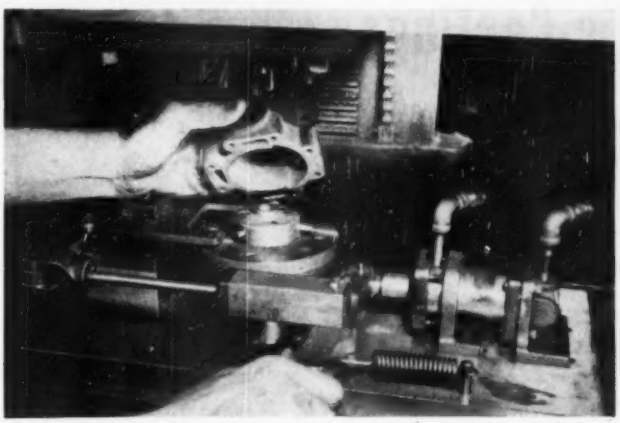
ONE pushbutton starts the Natco cycle that drills bonnet and body castings for Hanna "Unitite" valves in sizes from ½ to 1½ in. Interchangeable assembly of the tooling is made possible so similar but different-size castings can be machined accurately with little time loss due to setup. Special fittings on the drill include hydraulic devices to feed the table, air devices to engage the drillpress clutch and the workpiece clamp in the fixture, and interlocking electrical controls to make the cycle continuous and automatic.

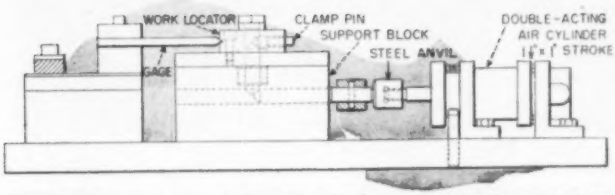


Support rails suspended under drillhead carry interchangeable aluminum guide plate with drill bushings. Gage matches plate location with fixture location; then drill sleeves are adjusted.



Hold-down assembly is a simple spring-loaded plunger threaded into a mounting nut that bolts to the guide plate. Pressure foot sticks through plate to hold work down when table raises





Workholder locates valve body with sliding gage plate (left) operated by lever (right). Clamping is done with three radial pins inside fixture head. Air cylinder (right) extends anvil and master pin, forcing vertical pin upward inside fixture body, which forces radial pins out to clamp work

Different setup for same body locates casting upside down. Shoulder pins nest in previously drilled holes. Pressure foot in guide plate prevents work from shifting when drilling is being done

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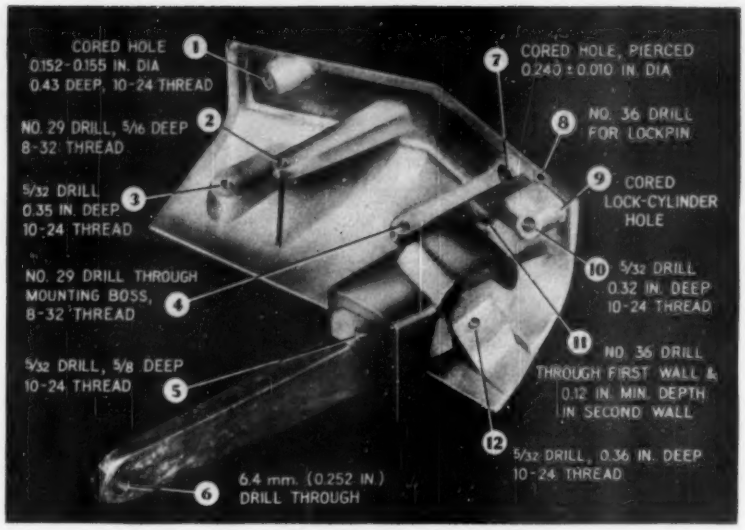


Hole location is complex. With 12 holes required, 9 are drilled and 3 cored. Tapping is called for at 7 points. This die-cast zinc alloy rear deck handle is produced, at a rate exceeding 300 pc per hr, with standard equipment arranged for maximum flexibility

Automatic Tools Drill and Tap Die-Castings

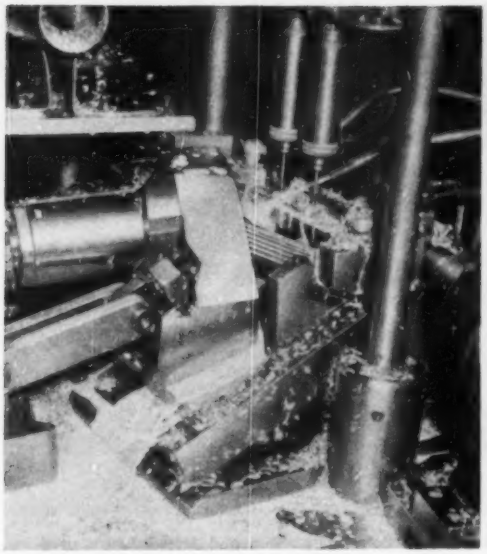
Competition demands that die-castings be completed with minimum operations and maximum quality . . . Here two-cavity casting plus standard drilling and tapping equipment combine to do just that

USUALLY, holes in die-castings are produced by coring the dies. Sometimes, for better die action and production speed or because hole arrangement is complex, it is more practical to drill the holes after casting. This was the condition found in processing rear deck handles for a large automotive company. These parts require 12 holes with widely varying dimensions, angles, and location. Three of the holes are produced by cores in the die; one of which has the core-flash at hole bottom removed by piercing along with a drilling operation. Nine other holes are drilled, and 7 of the 12 holes must be tapped.

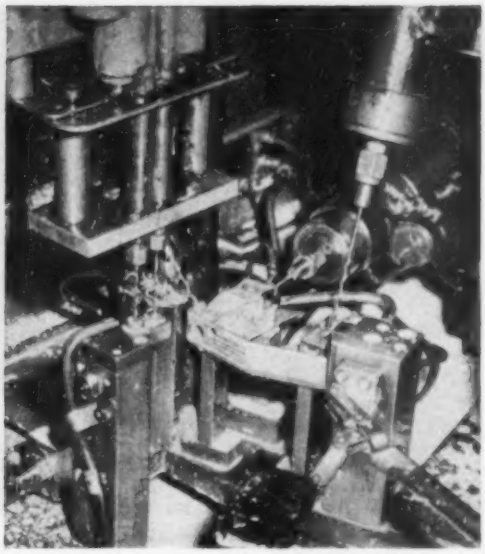
Drilling, sizing, and tapping operations are the most important characteristics of this casting. Tooling enables four operators to do the work normally requiring twelve operators using individual fixtures and standard drilling and tapping equipment. Nevertheless, the setup provides flexibility of equipment utilization for the day when this job becomes obsolete and new parts must be processed. All equipment, such as the four drillpresses, drill heads, tapping attachments, air cylinders, solenoids and relays, plus auxiliary drills and tappers, is standard. Each unit may be repositioned for another function; quick-disconnect receptacles also permit drilling and tapping units to be used on other fixtures.

Air-operated clamping on the two drilling machines moves the piece into drilling position and holds it firmly. Relays control the drilling cycle. When completed, the part is automatically withdrawn from the drilling position to permit easy removal. Clamping for tapping is by means of a manual lever; the lever engaging a slot at the bottom of the fixture.

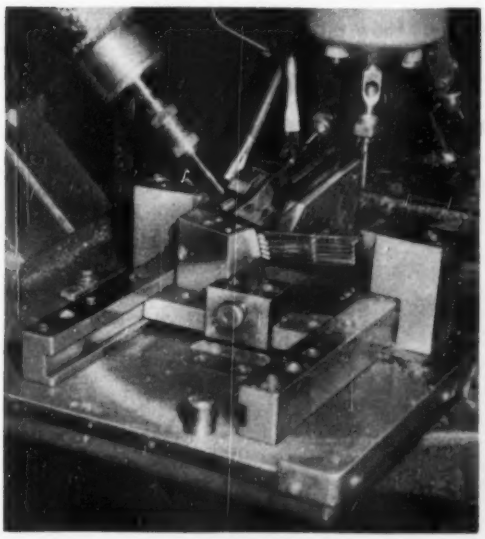
Zinc alloy (Zamak #3) is the material and the group of four machines complete more than 300 pieces per hr. Drilling units have a free running speed of 3450 rpm. Tapping units have a speed (free running) of 1725 rpm. Drillpress tapping attachments, as a result of the double spindle heads, run at 2500 rpm. Drill speed for the two No. 36 holes is 4500 rpm and feed is 6 ipm. Speed for the No. 29 holes is 3000 rpm; feed is 12 ipm. Drilling at this speed and feed prevents burring at breakout. Lubricant for drilling is a 50:1 mixture of soluble oil and water. Taps are lubricated by drip feeds with brushes attached. Fanox 32 is the lubricant. This keeps the pieces clean, hence eliminates a special cleaning operation as the handles are chromeplated prior to tapping; packed for shipment after tapping.



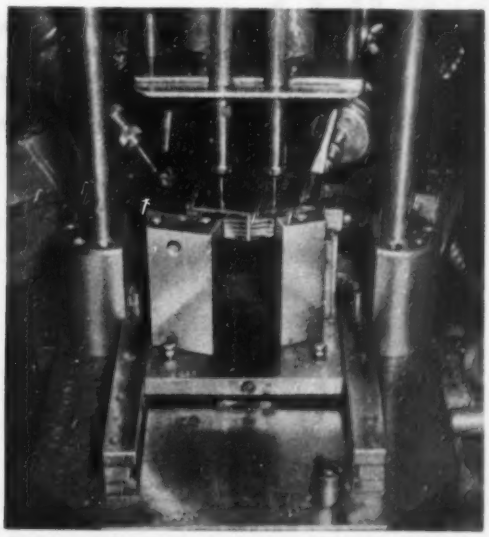
1 **Air cylinder clamps part** in position and actuates a punch to pierce flash in lock cylinder (9) hole. Self-propelled electric drills move in on slides and spindle descends simultaneously to produce holes 4, 2, 6, and 10. Hole No. 6 is burred by operator during machine cycle and as part is removed. Roller conveyor carries groups of parts to second machine . . .



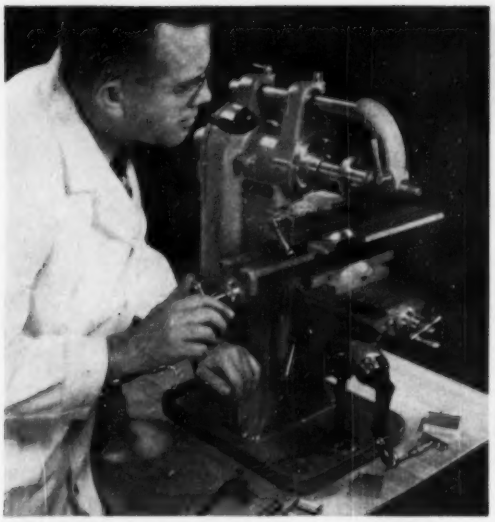
2 **Part is placed** in fixture by operator. Air cylinder moves fixture into first position and also actuates relays to drill holes 3, 12, and 5. Drills retract and fixture is moved forward into second position. Spindle descends to drill holes 11 and 8, then retracts and clamp is released. Micro-switches and relays actuate each phase of the cycle. Part is chrome plated before tapping . . .



3 **Tapping fixture** is pulled forward for loading, then pushed back against a positive stop and manually clamped. Holes 3, 12, and 5 are tapped. Fanox 32 is the lubricant applied by means of drip feeds with brushes attached. Drill press drives Procunier #2 tapping head at 1700 rpm . . .



4 **Self-contained unit** was designed for tapping holes 10, 1, 4, and 2. Fixture is mounted on standard drillpress table with tapping spindles built into fixture and driven, through reduction gear, by drill press spindle. Auxiliary drilling and tapping units are standard Govro-Nelson equipment



Flow-gage face is being milled to form small corrugations so materials used for dental impressions can be tested for physical characteristics in the lab

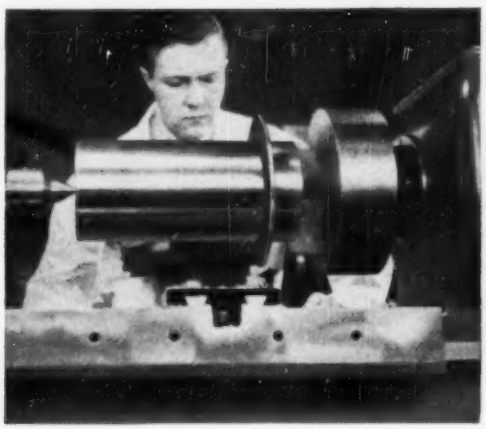
Light gun being assembled and tested has high-intensity lamp, permitting candling culture-laden eggs right in the carton, and preventing spills of viruses

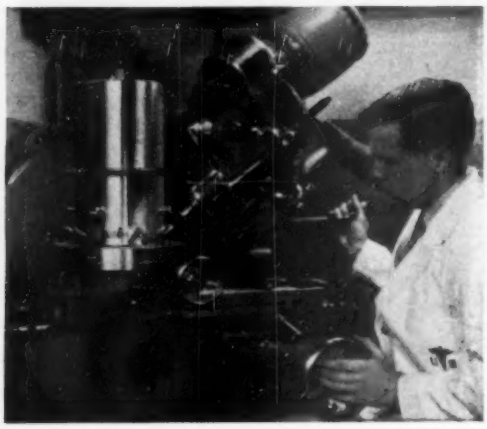
SHOP SHOTS

at

AMD, WASHINGTON

The Army Medical Department's Research and Graduate School boasts a new biophysical instrumentation department where instrument makers fabricate medical and laboratory equipment and electronic and electro-mechanical devices. These shots show the remarkably clean and careful atmosphere in which new devices are developed. Machining equipment includes an array of drills, mills, grinders, and lathes





Brass condenser for experimental freeze-drying unit is being flange-turned at left. Nipples in the brass manifold are being bored at right. Unit will be prototype for standard GI equipment to preserve bacteria

How to Work

TOOL and DIE STEELS

PART . . 2

A classified list of 800 tool and die steels based on SAE and JIC methods with names of suppliers, composition, typical properties, applications, and basic heat-treat data

Designed to aid in the selection of tool and die steels, this list supplements the basic information given in Part 1 (*AM*—Oct. 16 '50, p145). The steels are classified along the lines established by the tentative Society of Automotive Engineers (SAE) and the Joint Industry Committee of the Automotive Industry (JIC) standards. Where a JIC composition is given, the designation is that of JIC. Designations of the same type have been given to the other groups by AMERICAN MACHINIST. On most of the high-speed steels these are the same as the Gorham Tool Co. numbers. To avoid confusion with future standards the suffix A follows numbers not coming from JIC or Gorham.

Each group of steels includes a brief description of the properties and applications. The applications suggested are not a complete list nor do they indicate that the steels referred to are necessarily the best for those applications.

Temperature data for forging and heat treating are included for those groups not covered in Part 1. These temperatures will serve to indicate the general range and hence the equipment required, but will not apply exactly to every steel in the group.

Not covered by this list are such specialties as drill rod, ground flat stock, and the forging die blocks made by A. Finkl & Sons Co., Chicago, and Heppenstall Co., Pittsburgh. Nonferrous cast alloys for cutting tools are not included, but conventional tool and die steels furnished cast-to-shape are included.

The companies listed have cooperated by supplying the data on their steels. Every effort has been made to make the list as complete and accurate as possible. More information on the applications, use, and available forms of each steel can be obtained from the suppliers. Their names and addresses appear in full on the last page of the report.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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WATER-HARDENING TOOL STEELS

W-8, 9, 10, 12 . . . CARBON

SAE and JIC specifications for these steels appeared in Part I. Carbon content is W-8, .70-.85 C; W-9, .85-.95 C; W-10, .95-1.10 C; W-12, 1.10-1.30 C.

Plain carbon tool steel is made in four grades of quality: Special, Extra, Standard, and Commercial. Special and Extra conform to rigid macroscopic, microscopic, or hardenability specifications, Special being the highest quality. They are suitable for tools and dies requiring steel of uniform high quality. Standard and Commercial grades are not always made in electric furnaces and meet less rigid processing requirements. They are suitable for many general-purpose applications or for short-run jobs. Steels are listed below according to grade, with most of them available in any desired carbon content. W-10 is usually the standard carbon range.

COMPANY	SPECIAL	EXTRA	STANDARD	COMMERCIAL
Allegheny Ludlum	Pompton Special	Pompton Extra	Pompton	
Amalgamated	Creston No. 8	Creston No. 7	Creston No. 6	Creston No. 5
Atlas	XX-95, X-12, X-10	Refined 8, Refined 10	Alpha-8	Maple Leaf
Bethlehem	XXX	XX	XCL	X
Boyd-Wagner	Best		Standard	
Braeburn	Coldie*	Extra	Standard	
Carpenter	No. 11 Special	No. 11 Extra	No. 11 Comet	No. 11 Titan
Columbia	Special	Extra		
Craine-Schrage		Crasco Green Label		
Crucible	Sanderson Special	Sanderson Extra	Black Diamond	Granada
	Crescent Special	La Belle Extra		
Darwin & Milner	SSC Brand			
Diehl	Grade "A"			
Disston	Best	Extra	Standard	
Faitoute	Special, Duplex			
Firth-Sterling	Special ASV, FS Special	FS Extra	Sterling	Silver Star
Great Western	Special, Cold Header*	Extra	Regular	
Heller	Blue Label	Green Label	White Label	Purple Label
Houghton & Richards	Special Carbon	Carbon		
	Special Heading Die*			
Hoyland	Special, Cold Header*	Extra	Regular	
Jessop	Washington	Lion Extra		
	New Process Cold Header*		Lion	
Kloster	Special	Extra		
Latrobe	Special, Carbon Cold Header*	Extra	Standard	
McDonald	Special			
McInnes	Special	Superior	Misco A	Misco B
Milne	Orange Label	Red Label	White Label	Green Label
Peninsular		Penco—W. H.		
Republic	Special	Extra	Standard	Tool Grade
Simonds	Blue Label	Diamond S	Green Label	
Tennessee	Special			
Uddeholm		UHB Extra	UHB	
Universal-Cyclops	Special	Extra	Standard	
Vanadium-Alloys	Colonial No. 14	Extra L	Red Star	
Vulcan Crucible	Special	Extra	Fort Pitt	

Specially selected heats or sections of the billet for cold-heading dies

W-9V, 10V . . . CARBON-VANADIUM

SAE and JIC specifications for these steels appeared in Part 1. Carbon content is W-9V, .85-.95C; W-10V, .95-1.10C. Other carbon contents are available for many of the steels below. Vanadium, .15 to .35%.

Vanadium provides a finer grain, giving better toughness than the plain carbon steels. These steels have a wider hardening range than plain carbon steels.

Allegheny Ludlum . . . Python—.25V
Amalgamated . . . Car-Van Special, Car-Van—.20V
Atlas . . . Special Alloy 10, Special Alloy 8—.20V
Bethlehem . . . Best, Superior—.20V
Braeburn . . . Special—.20V
Craine-Schrage . . . Crasco Special Vanadium—.20V
Crucible . . . Alva Extra, Granada Vanadium—.20V
Firth-Sterling . . . Sterling V—.20V
Heller . . . Yellow Label—.20V
Houghton & Richards . . . Vanadium—.18V
Jessop . . . Washington Special—.20V
Latrobe . . . Special Carbon with V, Carbon Cold Header with V, Renown, Standard Carbon with V—.20V.
McDonald . . . B-29—.20V
Milne . . . Special Vanadium—.20V
Peninsular . . . Blue Label—.20V
Republic . . . Dumost—.30V
Ryerson . . . VD—.18V
Simonds . . . Blue Label V
Universal-Cyclops . . . Draco—.20V
Vanadium-Alloys . . . Colonial No. 7, Elvandie, Red Star Vanadium—.20V
Vulcan Crucible . . . Special Vanadium—.30V

W-10VV . . . CARBON-VANADIUM

SAE and JIC specifications in Part 1. Vanadium content: .35-.50.

Higher vanadium content than the V group provides appreciably better toughness.

Universal-Cyclops . . . Draco DV—as desired C, .45V
Vanadium-Alloys . . . Colhead—1.00 C, .45 V

W-Cr . . . CARBON-CHROMIUM

Chromium content increases the depth of hardness and reduces the danger of soft spots. Dies can be reground more times than with plain carbon steel. A number of the steels in this group are available in several carbon ranges. Some include vanadium for more toughness resulting from the finer grain structure.

Atlas . . . Q
1.20 C, .50 Cr
Bethlehem . . . Piston
1.15 C, .55 Cr, .20 V
Boyd-Wagner . . . Very Best
1.05 C, .30 Mn, .20 Si, .50 Cr, .10 V

Firth-Sterling . . . Diamond M
1.30 C, .28 Mn, .20 Si, .28 Cr
Firth-Sterling . . . AW Special
1.00 C, .20 Mn, .25 Si, 1.40 Cr, .20 V opt
Great Western . . . Vancro
.45 C, .70 Mn, .25 Si, 1.00 Cr, .15 V
Hoyland . . . Vanco
.45 C, .70 Mn, .25 Si, 1.00 Cr, .15 V
Latrobe . . . CFS
1.00 C, .50 Cr
Latrobe . . . Superb
.75 C, 1.00 Cr, .20 V
Peninsular . . . Black Label
1.10 C, .55 Cr, .20V
Republic . . . C-C
1.10 C, .60 Cr
Universal-Cyclops . . . Hercules
1.00 C, .50 Cr, .20 V
Vanadium-Alloys . . . CM
1.20 C, .60 Mn, .50 Cr.
Vanadium-Alloys . . . Type BB
1.00 C, 1.40 Cr, .20 V
Vanadium-Alloys . . . Types D, G, H, K, N
.80 Cr, .20 V, D—.50 C, G—.60 C, H—.70 C, K — .80 C, N—.90 C

W-Mo . . . CARBON MOLYBDENUM

Molybdenum content provides deeper hardening, increased toughness, and red hardness. The 6.00 Mo steel is an exception in that it has more wear resistance, less toughness.

Latrobe . . . Carbon Cold Header with Mo
.90 C, .25 Mn, .10 max Cr, .30 Mo
Latrobe . . . Mo Tap
1.20 C, .80 Mn, .50 Cr, 6.00 Mo
Ryerson . . . VD Chisel
.77 C, .30 Mn, .23 Si, .18 Mo
Vanadium-Alloys . . . Croman
1.20 C, .80 Mn, .50 Cr, .60 Mo

W-W . . . CARBON-TUNGSTEN (Finishing)

The steels with high carbon and about 3.50 W become intensely hard after quenching in water or brine. Primarily they are for light finishing cuts on hard materials when an exceptionally smooth surface is required. Also included in this group are carbon steels of lower tungsten content for similar applications.

Atlas . . . XXX
1.35 C, .30 Mn, .35 Cr, 3.75 W
Atlas . . . Denine
1.25 C, .25 Mn, .25 Si, 1.40 W
Bethlehem . . . BFS
1.30 C, .28 Mn, 4.00 W
Bethlehem . . . 67 Tap
1.25 C, .65 Cr, .20 V, 1.40 W
Carpenter . . . K-W
1.30 C, .30 Mn, .30 Si, 3.50 W
Crucible . . . Double Special
1.30 C, 3.50 W
Darwin & Milner . . . E-E
1.42 C, .25 Mn, .22 Si, .15 Cr, .30 V, 4.00 W
Firth-Sterling . . . RT Steel
1.30 C, .35 Mn, .25 Cr, 3.50 W
Great Western . . . 350
1.30 C, .30 Mn, .45 Si, 3.50 W
Houghton & Richards . . . Gold Label
1.33 C, .35 Mn, .49 Si, 4.25 W .35 Mo
Hoyland . . . 350
1.30 C, .30 Mn, .45 Si, 3.50 W
Jessop . . . Rapid Finishing
1.35 C, .75 Cr, 3.75 W
Latrobe . . . ESA
1.40 C, .50 Cr, .30 V, 4.00 W
Latrobe . . . Wolva
.90 C, .20 Cr, .90 W
Republic . . . Fast Finishing
1.35 C, 3.50 W
Timken . . . Graph-Tung (graphitic tool steel)
1.50 C, .50 Mn, .65 Si, 2.80 W, .50 Mo
Universal-Cyclops . . . Saturn
1.25 C, .25 Mn, .30 Si, 3.50 W
Vanadium-Alloys . . . Colonial No. 4
1.30 C, 3.50 W
Vulcan Crucible . . . Regal
1.35 C, 3.50 W

ABBREVIATIONS:
Max — Maximum
Opt — optional
C — carbon
Mn — manganese
Si — silicon
Cr — chromium
V — vanadium
W — tungsten
Mo — molybdenum

W-Al . . . ALUMINUM GRAPHITE

A shallow hardening steel for applications requiring toughness. A graphite steel, it is free machining. Suitable for drawing dies, mandrels, and rolls.

Timken . . . Graph-Al
1.50 C, .30 Mn, .20 Si, .15 Al

OIL-HARDENING TOOL STEELS

O-1 . . . LOW MANGANESE

SAE Composition: 90 C, 1.20 Mn, 25 Si, .50 Cr, .20 V opt, 50 W
JIC Composition: .85-1.05 C, 1.00-1.40 Mn, .15-.40 Si, .40-60 Cr, 30 max V, .40-.60 W

The most popular oil-hardening non-deforming tool steel. Not as tough as plain carbon steel but with better cutting ability, safety in hardening, and medium depth of hardness. Suitable for blanking, forming, and drawing dies, taps, hobs, milling cutters, and other tools and gages.

Allegheny Ludlum . . . Saratoga
.90 C, 1.20 Mn, .35 Si, .50 Cr, .50 W
Amalgamated . . . Dymol
.90 C, 1.15 Mn, .50 Cr, .50 W
Atlas . . . Keewatin
.90 C, 1.15 Mn, .30 Si, .50 Cr, .50 W
Bethlehem . . . BTR
.90 C, 1.20 Mn, .50 Cr, .20 V, .50 W
Boyd-Wagner . . . Arrow Swedish
.95 C, 1.20 Mn, .20 Si, .50 Cr, 10 V, .50 W
Boyd-Wagner . . . Bowco
.90 C, 1.20 Mn, .35 Si, .50 Cr, .50 W
Braeburn . . . Kiski
.95 C, 1.10 Mn, .50 Cr, .20 V, .60 W
Columbia . . . Exi-Die
.90 C, 1.15 Mn, .50 Cr, .50 W
Columbia . . . Oildie
.90 C, .65 Mn, 1.60 Cr, .50 W
Craine-Schrage . . . Crasco Red Label
.90 C, 1.15 Mn, .25 Si, .50 Cr, .50 W
Crucible . . . Ketos
.90 C, 1.30 Mn, .50 Cr, .50 W
Diehl . . . Utex
.90 C, 1.10 Mn, .25 Si, .50 Cr, .25 V, .70 W
Disston . . .Mansil
.90 C, 1.15 Mn, .50 Cr, .50 W
Faltoute . . . Oilhard
.90 C, 1.15 Mn, .30 Si, .50 Cr, .20 V, .50 W
Firth-Sterling . . . Invaro
.90 C, 1.15 Mn, .50 Cr, .20 V, .50 W
Great Western . . . Oil Hardening
.90 C, 1.10 Mn, .35 Si, .50 Cr, .50 W
Heller . . . Gray Label
.85 C, 1.25 Mn, .20 Si, .50 Cr, .50 W
Houghton & Richards . . . Tungsten Oil Hardening
.90 C, 1.10 Mn, .25 Si, .50 Cr, .20 V, .50 W
Houghton & Richards . . . Oil Hardening
.95 C, .95 Mn, .20 Si, .55 Cr
Hoyland . . . CW Oil
.90 C, 1.10 Mn, .35 Si, .50 Cr, .50 W
Jessop . . . Truform
.90 C, 1.17 Mn, .30 Si, .50 Cr, .50 W

Kloster . . . Swed-Oil
.97 C, 1.15 Mn, .30 Si, .47 Cr, .20 V, .47 W
Latrobe . . . Badger
.95 C, 1.20 Mn, .30 Si, .50 Cr, .50 W
McDonald . . . Royal Crown
.90 C, 1.20 Mn, .30 Si, .50 Cr, .25 V, .50 W
McInnis . . . Cello Vanadium
.90 C, 1.20 Mn, .35 Si, .50 Cr, .20 V, .50 W
Milne . . . Amcoh.
.95 C, 1.25 Mn, .50 Cr, .20 V, .50 W
Peninsular . . . Yellow Label
.90 C, 1.20 Mn, .30 Si, .50 Cr, .20 V, .50 W
Republic . . . Special Oil Hardening
.90 C, 1.20 Mn, .50 Cr, .50 W
Simonds . . . Teenax No. 46
.90 C, 1.25 Mn, .20 Si, .50 Cr, .20 V, .50 W
Uddeholm . . . UHB-46
.90 C, 1.20 Mn, .30 Si, .50 Cr, .10 V, .50 W
Universal-Cyclops . . . Wando
.90 C, 1.20 Mn, .25 Si, .50 Cr, .20 V, .50 W
Vanadium-Alloys . . .Non-Shrinkable, Colonial, No. 6
.95 C, 1.20 Mn, .30 Si, .50 Cr, .20 V, .50 W
Vulcan Crucible . . . Oil Hardening
.90 C, 1.20 Mn, .50 Cr, .50 W

O-2 . . . HIGH MANGANESE

SAE Composition: .90 C, 1.60 Mn., .25 Si, .55 Cr opt, .20 V opt, .30 Mo opt
JIC Composition: .85-1.05 C, 1.50-1.80, Mn, .15-.35 Si, .75 max Cr, .30 max V, .40 max Mo

With higher manganese content than O-1, this steel has slightly better red hardness, cutting ability and non-deformation properties. Toughness is considerably better and is the best of any of the standard oil hardening group. Suitable for blanking, forming, trimming, and molding dies, taps and threading dies, broaches, and reamers.

Allegheny Ludlum . . . Deward
.90 C, 1.55 Mn, .25 Si, .30 Mo
Braeburn . . . SOD
.90 C, 1.65 Mn
Carpenter . . . Stentor
.90 C, 1.60 Mn, .25 Si
Darwin & Milner . . . H Brand
.90 C, 1.50 Mn, .25 Si, .30 Mo
Houghton & Richards . . . No. 19
.92 C, 1.55 Mn, .32 Si, .18 Cr
Jessop . . . Special Oil Hardening
.95 C, 1.75 Mn, .35 Si
Latrobe . . . Mangano
.95 C, 1.60 Mn, .25 Si
Republic . . . Arrestite
.90 C, 1.50 Mn, .20 Cr
Ryerson . . . Ry-Alloy
.92 C, 1.55 Mn, .29 Si, .23 Mo
Simonds . . . No. 864
.90 C, 1.40 Mn, .25 Mo
Uddeholm . . . UCA 2-2
.90 C, 1.60 Mn, .65 Si, 1.50 Cr
Vulcan Crucible . . . Non-Shrinkable
.90 C, 1.50 Mn, .20 Cr

O-3 . . . CHROMIUM

SAE Composition: 1.00 C, .35 Mn, .25 Si, 1.40 Cr, .40 Mo
JIC Composition: .95-110C, .25-.50 Mn, .15-.35 Si, 1.20-1.50 Cr, .30-.50 Mo

Better red hardness than O-1 and O-2. Toughness is slightly better than O-1, not so good as O-2. Safety in hardening slightly less than other oil hardening grades. Suitable for some hot press work, ring dies, swaging tools and dies, taps, broaches, and gages.

Atlas . . . KK
1.10 C, .40 Mn, .20 Si, 1.40 Cr, .40 Mo
Boyd-Wagner . . . Bowco 7720
1.20 C, .55 Mn, .30 Si, 1.65 Cr, .45 Mo
Braeburn . . . Viking
1.00 C, .35 Mn, .25 Si, 1.40 Cr, .40 Mo
Crucible . . . Halcomb SS Tool
1.00 C, .35 Mn, 1.20 Cr, .30 Mo
Diehl . . . Hollobar Tubing
1.00 C, .30 Si, 1.50 Cr, .60 Mo
Latrobe . . . M Chrome
1.00 C, .35 Mn, .25 Si, 1.50 Cr
Peninsular . . . Hollobar
1.00 C, .40 Mn, 1.10 Cr, .30 Mo
Republic . . . UA-8
1.00 C, .35 Mn, 1.35 Cr, .35 Mo
Universal-Cyclops . . . Alloy B
1.05 C, .35 Mn, .30 Si, 1.35 Cr

O-4 . . . CHROME-NICKEL

JIC Composition: .65-.75 C, .40-.70 Mn, .20-.35 Si, .55-.75 Cr, .25-.35 Mo, 1.20-1.50 Ni

Toughness is the principal characteristic of this steel, being nearly as good as in the S group. Non-deforming properties are not as good as the other steels in this group, but are adequate for many applications. Suitable for punches, blanking, and forming dies, shear blades with intricate cutting edges, and forming rolls.

Allegheny Ludlum . . . Tioga
.68 C, .60 Mn, .25 Si, .65 Cr, .20 Mo, 1.40 Ni
Atlantic . . . Die Steel
.70 C, .40 Mn, .25 Si, 1.00 Cr, 1.60 Ni
Bethlehem . . . Bethalloy
.75 C, .75 Mn, .90 Cr, .35 Mo, 1.75 Ni
Carpenter . . . RDS
.75 C, .35 Mn, .25 Si, 1.00 Cr, 1.75 Ni
Crucible . . . Champaloy
.75 C, .70 Mn, .75 Cr, .30 Mo, 1.50 Ni
Disston . . . Nicroman
.70 C, .45 Mn, .20 Si, 1.00 Cr, 1.65 Ni, .35 Copper
Houghton & Richards . . . N 150
C per temper, .55 Mn, .30 Si, .85 Cr, .42 Mo, 1.40 Ni
McInnis . . . Chrome Die
.70 C, .70 Mn, .55 Cr, 1.50 Ni
Peninsular . . . Pen-O-Four
.70 C, .55 Mn, .30 Si, .65 Cr, .30 Mo, 1.35 Ni
Timken . . . Graph-M.N.S. (graphitic tool steel)
1.50 C, 1.25 Mn, 1.25 Si, .50 Cr, .50 Mo, 1.75 Ni
Universal-Cyclops . . . N 9
.75 C, .45 Mn, .20 Si, 1.00 Cr, 1.50 Ni
Vanadium-Alloys . . . Nikro M
.70 C, .55 Mn, .30 Si, .85 Cr, .25 Mo, 1.40 Ni

O-5 . . . HIGH CARBON-HIGH CHROMIUM

SAE Composition: 2.15 C, .35 Mn, .35 Si, 12.00 Cr, .80 V opt, .75 W opt, .80 Mo opt, .50 Ni opt
JIC Composition: 2.00-230 C, .20-.60 Mn, .20-1.00 Si, 11.00-13.00 Cr, 1.00 max V, 1.00 max Mo, 1.00 max W, .60 max Co, .60 max Ni

Extremely high abrasion resistance makes this steel suitable for blanking dies and punches for high production. Hardens more deeply than other oil-hardening steels. Poor shock resistance. Suitable for wire- and deep-drawing dies, swaging and blanking dies, gages, forming tools and rolls.

Allegheny Ludlum . . . Huron
2.15 C, .30 Mn, .25 Si, 12.50 Cr, 1.00 V
Amalgamated . . . Dy-Krome Special
2.15 C, 12.50 Cr, 1.00 V
Atlas . . . NN
2.25 C, .30 Mn, .25 Si, 12.50 Cr, .25 V
Bethlehem . . . Lehigh S
2.05 C, 11.75 Cr, .60 V
Bethlehem . . . Lehigh L
.85 C, 11.50 Cr, .30 V, .45 Mo, 1.00 Ni
Boyd-Wagner . . . Hypro 62
2.00 C, .60 Mn, .40 Si, 12.00 Cr
Boyd-Wagner . . . Hypro 63
1.70 C, .20 Mn, 18.00 Cr
Braeburn . . . Superior No. 1
2.15 C, 12.50 Cr, .60 V
Carpenter . . . Hampden
2.10 C, .25 Mn, .25 Si, 12.50 Cr, .50 Ni

Columbia . . . Super Die
2.10 C, .30 Mn, .90 Si, 11.50 Cr, 1.00 W
Crucible . . . HYCC
2.25 C, 11.50 Cr, .20 V, .80 Mo
Darwin & Milner . . . Neor
2.15 C, .50 Mn, .45 Si, 13.25 Cr, .50 Ni
Disston . . . 812
1.80 C, .30 Mn, .25 Si, 12.00 Cr
Firth-Sterling . . . Triple Die
2.20 C, 12.00 Cr, .15 V
Great Western . . . High Production
1.60 C, .30 Mn, .30 Si, 12.00 Cr, .20 V, .80 Mo
Houghton & Richards . . . K
2.32 C, .32 Mn, .22 Si, 13.00 Cr, .22 V
Hoyland . . . 265
1.60 C, .30 Mn, .30 Si, 12.00 Cr, .20 V, .80 Mo
Jessop . . . 3C
2.25 C, .30 Mn, .25 Si, 12.00 Cr, .20 V, .80 Mo
Latrobe . . . GSN
2.20 C, .50 Mn, .50 Si, 13.00 Cr
McInnes . . . High Carbon High Chrome
2.15 C, 13.00 Cr, 1.00 V, .50 Ni
Milne . . . Double Six
2.25 C, 13.00 Cr
Peninsular . . . White Label-S
2.15 C, .40 Mn, .60 Si, 12.00 Cr
Universal-Cyclops . . . Ultradie No. 1
2.25 C, .25 Mn, .20 Si, 12.00 Cr, .20 V
Universal-Cyclops . . . Ultradie No. 1M
2.25 C, .25 Mn, .20 Si, 12.00 Cr, .20 V, .80 Mo
Vanadium-Alloys . . . Crocar
2.20 C, .20 Mn, .30 Si, 12.00 Cr, .80 V, .50 Co

O-6 . . . MOLYBDENUM GRAPHITE

SAE Composition: 1.45 C, .65 Mn, 1.00 Si, .25 Mo
JIC Composition: 1.35-1.55C, .30-1.00 Mn, .75-1.25 Si, .20-.30 Mo

Graphite particles amounting to about one third of the carbon content are distributed through this steel. They make for easy machining and good wear resistance. Suitable for forming, blanking, and trimming dies, punches, and gages.

Allegheny Ludlum . . . Oilgraph
1.30 C, 1.00 Mn, 1.40 Si, .25 Cr, .25 Mo
Peninsular . . . Graphmo
1.45 C, .65 Mn, 1.00 Si, .25 Mo
Timken . . . Graph-Mo
1.45 C, 1.00 Mn, 1.25 Si, .25 Mo

O-7A . . . TUNGSTEN

Better cutting ability than the other oil-hardening steels except O-5 with high hardness and fairly deep hardening. Suitable for taps, threading tools, drills, reamers, cutting tools for brass, and punches and dies for light stock. Forging temperature 1750 to 1900 F, annealing 1500 to 1550 F, hardening 1550 to 1650 F, tempering 325 to 500 F.

Allegheny Ludlum . . . Utica
1.25 C, .30 Mn, .30 Si, .40 Cr, .20 V, 1.40 W
Atlas . . . Badger
1.25 C, .25 Mn, .25 Si, .40 Cr, .20 V, 1.50 W
Firth-Sterling . . . Meteor
1.20 C, .30 Mn, .25 Cr, .15 V, 1.50 W
Houghton & Richards . . . No. 60
1.20 C, .25 Mn, .30 Si, .70 Cr, .20 V, 1.60 W, .25 Mo
Latrobe . . . WT
1.20 C, .25 Mn, .30 Si, .40 Cr, .40 V, 1.50 W, .30 Mo
Simonds . . . OHD
1.20 C, .35 Mn, .25 Si, .60 Cr, .20 V, 1.50 W
Universal-Cyclops . . . Para
1.20 C, .30 Mn, .20 Si, .40 Cr, .20 V, 1.60 W
Vanadium-Alloys . . . Red Star Tungsten
1.20 C, .70 Cr, .20 V, 1.60 W, .25 Mo

AIR-HARDENING TOOL STEELS

A-1 . . . HIGH CARBON-HIGH CHROMIUM

SAE Composition: 1.50 C, .40 Mn, .40 Si, 12.00 Cr, .80 V opt, .90 Mo, .60 Co opt
JIC Composition: 1.40-1.60 C, .20-.60 Mn, .20-.60 Si, 11.00-13.00 Cr, 1.00 max V, .70-1.10 Mo, .60 max Co, .60 max Ni

Properties are similar to O-5. This steel has better safety in hardening and high abrasive resistance. Deep hardening. Some corrosion resistance. Suitable for punches, blanking, forming, and drawing dies, and gages.

Allegheny Ludlum . . . Ontario
1.50 C, .40 Mn, .30 Si, 12.00 Cr, .20 V, .80 Mo
Amalgamated . . . Dykrome
1.50 C, 11.50 Cr, .25 V, .75 Mo
Atlas . . . FNS
1.50 C, .30 Mn, .30 Si, 12.00 Cr, .25 V, .80 Mo
Bethlehem . . . Lehigh H
1.55 C, 11.50 Cr, .40 V, .80 Mo
Boyd-Wagner . . . Hypro 61
1.50 C, .25 Mn, .40 Si, 11.50 Cr, .85 V, .80 Mo, .40 Co
Braeburn . . . Superior No. 3
1.50 C, 12.00 Cr, .80 V, .80 Mo
Carpenter . . . 610
1.50 C, .30 Mn, .30 Si, 12.00 Cr, .90 V, .80 Mo
Columbia . . . Atmodie
1.50 C, 12.00 Cr, .85 V, .85 Mo
Craine-Schrage . . . Crasco Black Label
1.50C, .35 Mn, .25 Si, 12.00 Cr, .20 V, .80 Mo
Crucible . . . Airdie 150
1.50 C, 11.50 Cr, .20 V, .80 Mo
Darwin & Milner . . . Darwin No. 1
1.50 C, .35 Mn, .40 Si, 12.00 Cr, .25 V, 75 Mo, .40 Ni
Detroit . . . Castaloy
1.50 C, .55 Mn, .42 Si, 13.50 Cr, .45 V, .85 Mo, .65 Co, .45 max Ni
Diehl . . . Hicro
1.55 C, .25 Mn, .35 Si, 12.00 Cr, .35 V, .80 Mo
Disston . . . Croloy
1.50 C, 12.00 Cr, 1.00 V, .80 Mo
Faltoute . . . Chromdie
1.55 C, 11.50 Cr, 1.40 V, .85 Mo
Firth Sterling . . . Chromovan Die
1.60 C, 12.50 Cr, 1.00 V, .80 Mo
Houghton & Richards . . . K-2
1.50 C, .25 Mn, .50 Si, 11.50 Cr, .25 V, .75 Mo
Jessop . . . CNS
1.50 C, .30 Mn, .25 Si, 12.00 Cr, .25 V, .75 Mo
Kloster . . . Pure-Ore Hi-Run
1.55 C, .35 Mn, .45 Si, 12.00 Cr, .30 V, .83 Mo
Latrobe . . . Olympic
1.50 C, .30 Mn, .30 Si, 12.00 Cr, 1.00 V, .80 Mo
McDonald . . . Kromax 1
1.50 C, .34 Mn, .23 Si, 11.90 Cr, .28 V, .90 Mo
Milne . . . High Production
1.55 C, 11.50 Cr, 1.00 V, .75 Mo
Peninsular . . . White Label
1.50 C, 12.00 Cr, .35 V, .80 Mo
Republic . . . 404
1.55 C, 12.00 Cr, .25 V, .75 Mo
Simonds . . . CCM
1.55 C, .25 Mn, .35 Si, 12.00 Cr, .35 V, .80 Mo
Uddeholm . . . Tri-Mo
1.50 C, .45 Mn, .30 Si, 12.00 Cr, .20 V, .80 Mo
Universal-Cyclops . . . Ultradie No. 2
1.50 C, .25 Mn, .30 Si, 12.00 Cr, .25 V, .80 Mo
Universal-Cyclops . . . Ultradie No. 3
1.50 C, .25 Mn, .30 Si, 12.00 Cr, .90 V, .80 Mo
Vanadium-Alloys . . . Ohio Die
1.50 C, .25 Mn, .38 Si, 12.00 Cr, .85 V, .80 Mo .40 Co
Vulcan Crucible . . . Alidie
1.55 C, 12.00 Cr, .75 Mo, .25 V

A-2 . . . 5% Chrome Air Hardening

SAE Composition: 1.00 C, .60 Mn, .25 Si, 5.25 Cr, .40 V opt
JIC Composition: .90-1.05 C, .30-.90 Mn, .15-.35 Si, 4.75-5.50 Cr, 1.00 max V, .90-1.25 Mo

This steel is intermediate between O-5 or A-1 and O-1 or O-2. It is tougher than the former, more wear resistant than the latter. Deep hardening. Suitable for punches, blanking and forming dies, gages, and shear blades.

Allegheny Ludlum . . . Sagamore
1.00 C, .50 Mn, .30 Si, 5.00 Cr, .25 V, 1.00 Mo
Amalgamated . . . Mal-Die
1.00 C, .60 Mn, 5.25 Cr, .25 V, 1.10 Mo
Atlantic . . . Hardnair
1.30 C, .52 Mn .95 Si, 5.00 Cr, .33 V, 1.25 Mo
Atlas . . . Cro-Mo-Loy
1.00 C, 1.00 Mn, .30 Si, 5.00 Cr, .25 V, 1.00 Mo
Bethlehem . . . A-H5
1.00 C, .60 Mn, 5.25 Cr, .25 V, 1.10 Mo
Braeburn . . . Airque
1.00 C, .70 Mn, 5.25 Cr, .25 V, 1.15 Mo
Carpenter . . . 484
1.00 C, .70 Mn, .20 Si, 5.00 Cr, .20 V, 1.00 Mo
Crucible . . . Airkool
1.00 C, .40 Mn, 5.25 Cr, .40 V, 1.15 Mo
Darwin & Milner . . . Mineor
1.00 C, .55 Mn, .40 Si, 5.00 Cr, .25 V, 1.00 Mo
Firth-Sterling . . . Airvan Die
1.00 C, .65 Mn, .35 Si, 5.25 Cr, .25 V, 1.15 Mo
Great Western . . . CVM
1.00 C, .70 Mn, .20 Si, 5.00 Cr, .25 V, 1.10 Mo
Houghton & Richards . . . No. 80
1.00 C, .65 Mn, .20 Si, 5.25 Cr, .25 V, 1.10 Mo
Hoyland . . . CVM
1.00 C, .70Mn, .20 Si, 5.00 Cr, .25 V, 1.10 Mo
Jessop . . . Windsor
1.00 C, .50 Mn, .45 Si, 5.00 Cr, .30 V, 1.25 Mo
Kloster . . . Air-Chrom
1.00 C, .57 Mn, .23 Si, 5.30 Cr, .26 V, 1.00 Mo
Latrobe . . . Select B
1.00 C, 5.00 Cr, .30 V, 1.00 Mo
McDonald . . . 35 Air Hard
1.00 C, .60 Mn, .25 Si, 5.25 Cr, .25 V, 1.15 Mo
McInnes . . . M-10 Air Hardening
1.00 C, .70 Mn, 5.00 Cr, 1.05 Mo
Milne . . . Milnair 5
1.00 C, 5.25 Cr, .25 V, 1.10 Mo
Peninsular . . . Penair No. 5
1.00 C, .60 Mn, .25 Si, 5.00 Cr, .25 V, 1.10 Mo
Simonds . . . Airtrue
1.00 C, .65 Mn, .25 Si, 5.25 Cr, .30 V, 1.00 Mo
Uddeholm . . . UHB Rigor
1.00 C, .60 Mn, .25 Si, 5.25 Cr, .20 V, 1.10 Mo
Universal-Cyclops . . . Sparta
1.00 C, .65 Mn, .30 Si, 5.25 Cr, .25 V, 1.10 Mo
Universal-Cyclops . . . Sparta 80
.80 C, .65 Mn, .30 Si, 5.25 Cr, .25 V, 1.10 Mo
Vanadium-Alloys . . . Air Hard
1.00 C, 1.75 Mn, .30 Si, 5.00 Cr, .25 V, 1.10 Mo
Vulcan Crucible . . . Vuldie
1.00 C, 5.25 Cr, .25 V, 1.15 Mo

A-3 . . . HIGH CARBON-HIGH CHROME-COBALT

SAE Composition: 1.50 C, .40 Mn, .40 Si, 12.00 Cr, .80 V opt, .90 Mo, 3.10 Co
JIC Composition: 1.40-1.60 C, .20-.60 Mn, .20-.60 Si, 11.00-13.00 Cr, 1.00 max V, .70-1.10 Mo, 2.70-3.50 Co, .60 max Ni

Good abrasion resistance and the ability to hold a keen cutting edge are characteristics of this steel. Safe hardening and good non-deforming properties. Suitable for blanking and forming dies, burnishing tools, and some hot-work applications.

Amalgamated . . . Cobaltloy
1.50 C, 12.00 Cr, .50 V, .90 Mo, 3.25 Co
Braeburn . . . . Superior No. 2
1.50 C, .40 Mn, .40 Si, 12.00 Cr, .90 Mo, 3.10 Co
Darwin & Milner . . . PRK-33
1.40 C, .30 Mn, .60 Si, 13.00 Cr, .60 Mo, 3.30 Co, .50 Ni
Detroit . . . Krokoloy
1.50 C, .55 Mn, .42 Si, 13.50 Cr, .85 Mo, 3.25 Co, .45 max Ni
Detroit . . . Martin
1.50 C, .55 Mn, .42 Si, 13.50 Cr, 1.05 Mo, 1.30 Co, .45 max Ni
Houghton & Richards . . . No. 61
1.35 C, .25 Mn, .50 Si, 12.12 Cr, .64 Mo, 3.04 Co
Jessop . . . 3C Special
145 C, .30 Mn, .40 Si, 12.50 Cr, .80 Mo, 3.20 Co
Latrobe . . . Cobalt Chrome
1.30 C, 12.00 Cr, .80 Mo, 3.00 Co
McDonald . . . Kromax 2
1.40 C, .32 Mn, .42 Si, 12.50 Cr, .85 Mo, 3.25 Co
Milne . . . Double Seven
1.35 C, 12.50 Cr, .60 Mo, 3.00 Co
Universal-Cyclops . . . EK 81
1.35 C, .30 Mn, .65 max Si, 12.75 Cr, .80 Mo, 3.00 Co

A-4A . . . MANGANESE

Low hardening temperature of this steel is combined with good toughness, though wear resistance is lower than the other non-deforming steels. Suitable for punches, blanking and forming dies, and gages. Forging temperature 2000 F, annealing 1350 to 1400 F, hardening 1500 to 1550 F, tempering 300 to 400 F.

Allegheny Ludlum . . . Airloy
1.00 C, 3.00 Mn, 1.00 Cr, 1.00 Mo
Bethlehem . . . BAH
.95 C, 2.00 Mn, 2.20 Cr, 1.10 Mo
Carpenter . . . Vega
.70 C, 2.00 Mn, .30 Si, 1.00 Cr, 1.35 Mo
Republic . . . Airaloy
1.00 C, 2.00 Mn, .90 Cr, .90 Mo
Vulcan Crucible . . . Vairloy
1.00 C, 2.00 Mn, .90 Cr, .90 Mo

A-5A . . . HIGH CHROME-VANADIUM

A cold-work die steel with high abrasion resistance. Suitable for lamination dies, cold work dies and punches, and wear-resisting tools and dies.

Latrobe . . . BR-4
2.40 C, 12.75 Cr, 4.00 V, 1.10 Mo

SHOCK-RESISTING TOOL STEELS

S-1 . . . CHROMIUM-TUNGSTEN

SAE Composition: .50 C, .25 Mn, .35 Si, 1.40 Cr, .20 V, 2.25 W, .40 Mo opt
JIC Composition: .45-.55 C, .15-.40 Mn, .15-1.20 Si, 1.10-1.75 Cr, .15-.30 V, .60 max Mo, 2.00-3.00 W

Excellent shock resistance for both hot and cold operation. Though red hardness is not as good as in the H steels, it is better than other S steels. Suitable for punches, chisels, pneumatic tools, and bolt-header dies.

Allegheny Ludlum . . . Seminole Hard
.52 C, .25 Mn, .70 Si, 1.50 Cr, .25 V, 2.00 W
Allegheny Ludlum . . . Seminole Medium
.42 C, .25 Mn, .30 Si, 1.50 Cr, .25 V, 2.00 W
Amalgamated . . . Super-Shock
.50 C, .75 Si, 1.15 Cr, .20 V, 2.50 W
Atlantic . . . Tuncro
.50 C, .25 Mn, .25 Si, 1.40 Cr, .25 V, 2.00 W
Atlas . . . Falcon 4
.45 C, .25 Mn, .30 Si, 1.50 Cr, .25 V, 2.00 W

Atlas . . . Falcon 6
.55 C, .25 Mn, .30 Si, 1.50 Cr, .25 V, 2.00 W
Bethlehem . . . 67 Chisel
.50 C, .75 Si, 1.15 Cr, .20 V, 2.50 W
Braeburn . . . Vibro
.50 C, .25 Mn, .25 Si, 1.40 Cr, .25 V, 1.90 W
Columbia . . . Buster
.60 C, .30 Mn, .70 Si, 1.20 Cr, .25 V, 2.15 W
Crucible . . . Atha Pneu
.50 C, 1.25 Cr, .20 V, 2.75 W
Darwin & Milner . . . Ideor
.50 C, .25 Mn, .30 Si, 1.50 Cr, .25 V, 2.00 W
Disston . . . Keystone
.50 C, .30 Mn, .20 Si, 1.10 Cr, .20 V, 2.00 W
Firth-Sterling . . . JS Punch
.50 C, .30 Mn, 1.40 Cr, .25 V, 2.25 W
Houghton & Richards . . . No. 225
.50 C, .25 Mn, 1.50 Cr, .25 V, 2.50 W, .50 max Mo
Jessop . . . Top Notch
.50 C, .30 Mn, .70 Si, 1.15 Cr, .20 V, 2.40 W
Kloster . . . Chiz Alloy, Super Alloy
.50 C, .35 Mn, .95 Si, 1.25 Cr, .22 V, 2.37 W
Latrobe . . . XL Chisel
.55 C, .25 Mn, .25 Si, 1.50 Cr, .20 V, 2.00 W
McDonald . . . Foolproof
.55 C, .25 Mn, .25 Si, 1.40 Cr, .30 V, 2.40 W
McInnes . . . Special Punch and Chisel
.50 C, .25 Mn, .70 Si, 1.54 Cr, .25 V, 2.00 W
Milne . . . A 020
.50 C, 1.50 Cr, .25 V, 2.25 W
Peninsular . . . Brown Label
.50 C, .20 Mn, .75 Si, 1.20 Cr, .20 V, 2.50 W
Republic . . . C-V
.50 C, 1.20 Cr, .25 V, 2.20 W
Simonds . . . Commando 47
.47 C, .25 Mn, .80 Si, 1.40 Cr, .25 V, 2.00 W, .25 Mo
Uddeholm . . . Regin 711
.50 C, .20 Mn, .75 Si, 1.15 Cr, .20 V, 2.50 W
Universal-Cyclops . . . Alco M
.45 C, .30 Mn, .25 Si, 1.50 Cr, .25 V, 2.25 W, .50 Mo
Vanadium Alloys . . . Par Exc
.53 C, .20 Mn, .25 Si, 1.60 Cr, .25 V, 2.00 W
Vulcan Crucible . . . Q. A.
.50 C, 1.20 Cr, .25 V, 2.20 W

S-2 . . . SILICON-MOLY

SAE Composition: .50 C, .40 Mn, 1.00 Si, .25 V opt, .50 Mo
JIC Composition: .45-.55 C, .30-.50 Mn, .90-1.20 Si, .50 max V, .30-.60 Mo

This steel has the highest toughness of any tool steel. Red hardness is not as good as S-1. Other characteristics are about the same as S-1. Suitable for punches, hammer dies, and swaging dies.

Braeburn . . . Triton
.50 C, .35 Mn, 1.00 Si, .60 Mo
Carpenter . . . Solar
.50 C, .40 Mn, 1.00 Si, .50 Mo
Delaware . . . Delsteel
.50 C, .35 Mn, .85 Si, .20 V, .55 Mo
Houghton & Richards . . . Silico
.50 C, .45 Mn, 1.10 Si, .20 V, .50 Mo
Latrobe . . . Trident
.55 C, .30 Mn, .70 Si, .60 Cr, .20 V, .40 Mo
Peninsular . . . Penco No. 71
.50 C, .40 Mn, 1.05 Si, .20 V, .45 Mo
Simonds . . . Havoc
.50 C, .40 Mn, 1.00 Si, .20 V, .50 Mo
Universal-Cyclops . . . Venango
.50 C, .45 Mn, 1.10 Si, .20 V, .50 Mo
Universal-Cyclops . . . Venango Special
.68 C, .55 Mn, 1.10 Si, .20 V, .55 Mo

S-3 . . . LOW CHROMIUM-TUNGSTEN

JIC Composition: .45-.55 C, .35-.55 Mn, .15-.35 Si, .70-.90 Cr, .15-.30 V, 1.00-1.25 W

Toughness is combined with fair cutting ability. Suitable for chisels, rivet sets, punches, screwdrivers, and shear blades. Forging temperature 1900 to 2100 F, annealing 1450 F, hardening 1500 to 1550 F, tempering 400 to 600 F.

Great Western . . . Mirycal
.50 C, .25 Mn, .20 Si, .95 Cr, 1.00 W, .20 Mo
Hoyland . . . 422
.50 C, .25 Mn, .20 Si, .95 Cr, 1.00 W, .20 Mo
Republic . . . M Tungsten
.50 C, .35 Mn, 1.00 Cr, 1.00 W
Vulcan Crucible . . . Blue Edge
.50 C, 1.00 Cr, 1.00 W

S-4 . . . SILICON-MANGANESE

SAE Composition: .55 C, .80 Mn, 2.00 Si, .30 Cr opt, .25 V opt, .40 Mo opt (see also S-5)
JIC Composition: .50-.65 C, .60-1.00 Mn, 1.75-2.25 Si, .35 max Cr, .30 max V, .30 max Mo

This is the basic silicon-manganese steel. Good toughness, suitable for shear blades, chisels, punches, and pneumatic tools.

Allegheny Ludlum . . . 609
.60 C, .80 Mn, 2.00 Si, .25 Cr, .20 V, .25 Mo
Atlas . . . Monark 2
.60 C, .75 Mn, 2.00 Si, .30 Cr, .20 Mo
Bethlehem . . . 71 Alloy
.60 C, .90 Mn, 2.00 Si
Braeburn . . . Alloy No. 10
.55 C, .80 Mn, 2.00 Si
Crucible . . . La Belle 2-70
.60 C, .75 Mn, 1.90 Si, .25 Cr
Houghton & Richards . . . No. 8
.55 C, .85 Mn, 2.10 Si, .25 Cr, .25 V
Houghton & Richards . . . No. 8M
.55 C, .75 Mn, 2.00 Si, .20 Mo
Latrobe . . . Damascus
.55 C, 1.00 Mn, 2.00 Si, .30 Cr, .30 V
McDonald . . . Silicon Manganese
.63 C, .78 Mn, 2.00 Si
Republic . . . Special Punch
.55 C, .85 Mn, 2.00 Si, .25 Cr, .30 V
Universal-Cyclops . . . No. 67
.55 C, .85 Mn, 2.00 Si, .20 Mo
Vanadium-Alloys . . . Silman
.55 C, .85 Mn, 2.00 Si, .25 Cr, .20 V
Vulcan Crucible . . . 4870
.55 C, .85 Mn, 2.00 Si, .25 Cr, .20 V

S-5 . . . HIGH SILICON MANGANESE

SAE Composition: .55 C, .80 Mn, 2.00 Si, .30 Cr opt, .25 V opt, .40 Mo opt (see also S-4)
JIC Composition: .50-.65 C, .60-1.00 Mn, 1.75-2.25 Si, .35 max Cr, .30 max V, .30-.60 Mo

Toughness almost as good as S-2 and better red hardness than S-4 because of the molybdenum content. Suitable for chisels, heavy-duty punches, rivet busters, drift pins, spring collets, and nail sets.

Allegheny Ludlum . . . 602
.50 C, .70 Mn, 1.70 Si, .12 V, .40 Mo
Amalgamated . . . Duro-Chip
.60 C, .70 Mn, 1.85 Si, .25 V, .50 Mo
Bethlehem . . . Omega
.60 C, .70 Mn, 1.85 Si, .25 V, .50 Mo
Crucible . . . La Belle Silicon No. 2
.60 C, .75 Mn, 1.90 Si, .25 Cr, .30 Mo
Disston . . . D 29
.55 C, .80 Mn, 1.40 Si, .10 V, .50 Mo
Faltoute . . . Omega
.60 C, .70 Mn, 1.85 Si, .20 V, .45 Mo
Firth-Sterling . . . Chimo
.55 C, .80 Mn, 2.00 Si, .18 V, .50 Mo
Great Western . . . Tufkut
.50 C, .70 Mn, 1.50 Si, .35 Mo
Houghton & Richards . . . Silco
.55 C, .70 Mn, 2.15 Si, .20 V, .45 Mo
Hoyland . . . 280
.50 C, .70 Mn, 1.50 Si, .35 Mo

Jessop . . . RTS
.55 C, .50 Mn, .80 Si, .45 Mo
Jessop . . . Magic
.52 C, .90 Mn, 2.00 Si, 1.00 Mo
Latrobe . . . Lanark
.55 C, 1.00 Mn, 2.00 Si, .20 Cr, .30 V, 1.20 Mo
Milne . . . MSM
.55 C, .80 Mn, 1.90 Si, .25 V, .50 Mo
Peninsular . . . Silver Label
.57 C, .75Mn, 1.85 Si, .20 V, .45 Mo
Vanadium-Alloys . . . Mosil
.55 C, .90 Mn, 2.00 Si, .30 Cr, .30 Mo

S-6A . . . NON TEMPERING

A general-purpose tool steel for shock resistance where accurate temperature control is not available. Can be hardened over a wide range with satisfactory results. No tempering required. Forging temperature 2100 to 2150 F, annealing 1400 F, hardening 1500 to 1800 F.

Amalgamated . . . Malga Non-Tempering Special
.35 C, .75 Mn, .35 Si, .80 Cr, .25 W, .50 Mo
Atlantic . . . 33
.33 C, .40 Mn, .65 Si, .75 Cr, .75 Mo, .75 Cu
Bethlehem . . . Non-Tempering
.35 C, .40 Mn, .55 Si, .70 Cr, .50 Mo, .50 Cu
Heller . . . Non-Tempering
.35 C, .40 Mn, .55 Si, .70 Cr, .50 Mo, .50 Cu
Milne . . . FPC
.35 C, .70 Mn, .80 Cr, .45 Mo

S-7A . . . CHROME-VANADIUM

Toughness is combined with ease of heat treatment and some hot-work properties. Suitable for die-casting, dies (for Zinc), chisels, shear blades, and punches. Forging temperature 2000 to 2050 F, annealing 1425 F, hardening 1675 F, tempering 350 or 950 F.

Bethlehem . . . Tough M
.45 C, .55 Mn, .20 Si, .95 Cr, .20 V
Craine-Schrage . . . Crasco Yellow Label
.50 C, .80 Mn, 1.00 Cr, .20 V
Crucible . . . Halvan
.50 C, .80 Mn, 1.00 Cr, .20 V
Jessop . . . ET No. 6
.50 C, .80 Mn, .20 Si, .95 Cr, .17 V
Latrobe . . . Crown
.50 C, .80 Mn, 1.00 Cr, .20 V
Universal-Cyclops . . . Orion
.50 C, .60 Mn, .25 Si, 1.00 Cr, .20 V

S-8A . . . CHROME-MOLYBDENUM

Better shock resistance than carbon steel with good cutting ability. Developed for cutting dies for leather, rubber, paper, and fabrics. Also suitable for wood working tools, hand chisels, and boring bars. Forging temperature 1750 to 1950 F, annealing 1425 F, hardening 1550 to 1600 F, tempering 400 or 900 F.

Allegheny Ludlum . . . Atlas 93
.55 C, .55 Mn, .20 Si, .65 Cr, .35 Mo
Darwin & Milner . . . DSS
.52 C, .60 Mn, .25 Si, .75 Cr, .35 Mo
Hoyland . . . Alloy Shoe Die
.50 C, .60 Mn, .60 Cr, .40 Mo

S-9A . . . CHROME-NICKEL

Shock resistance for hubs, forming rolls, short run and experimental dies, cold forming and bending dies.

Boyd-Wagner . . . Formaloy
.75 C, .30 Mn, .25 Si, 1.00 Cr, .20 Mo, 1.75 Ni
Jessop . . . ET No. 4
.70 C, .65 Mn, .20 Si, .55 Cr, .25 Mo, 1.30 Ni
Latrobe . . . NDS
.75 C, 1.00 Cr, 1.70 Ni

S-10A . . . NICKEL

Non-deforming properties and wear resistance are combined with shock resistance. Suitable for intricate hobs, forming dies, and punches. Forging 1875 to 1975 F, annealing 1550 F, hardening 1600 F, tempering 375 or 850 F.

Latrobe . . . Staminal
.55 C, 1.00 Mn, 1.00 Si, .40 Cr, .40 Mo, 2.70 Ni

S-11A . . . CHROME-MANGANESE

Toughness combined with ease of heat treatment and machining. Suitable for hard chisels and battering tools. Forging temperature 1850 to 1950 F, hardening 1650 F (oil quench) or 1850 F (water quench), tempering 300 to 500 F.

Amalgamated . . . Rexor
.35 C, .70 Mn, .15 Si, .60 Cr, .35 Mo, .20 Ni

S-12A . . . CHROME-MANGANESE-TUNGSTEN

Toughness combined with moderate wear resistance. Suitable for forging dies and blacksmith tools. Higher carbon version is harder and has better cutting ability suitable for shear blades, trim dies, and collets. Forging temperature 1800 to 2100 F, annealing 1450 F, hardening 1500 F, (water quench) or 1600 F (oil), tempering 400 to 1000 F.

Republic . . . UA-4
.50 C, .60 Mn, 1.00 Cr, .25 W
Republic . . . UA-6
.65 C, .60 Mn, 1.00 Cr, .25 W

HOT-WORK TOOL STEELS

H-1 . . . CHROME-MOLY-TUNGSTEN

SAE Composition: .35 C, .30 Mn, 1.00 Si, 5.00 Cr, .25 V opt, 1.25 W, 1.50 Mo
JIC Composition: .32-.38 C, .20-.50 Mn, .80-1.20 Si, 4.75-5.50 Cr, .50 max V, 1.00-1.75 W, 130.-1.80 Mo

General-purpose hot-work steel with good toughness, red hardness, and wear resistance. Resists softening up to 1000 F. Suitable for dies, dummy blocks, and other parts for extrusion of aluminum, magnesium, and brass; gripper and header dies; punches, hot billet shears, and die-casting dies.

Allegheny Ludlum . . . Potomac
.33 C, .30 Mn, .85 Si, 5.00 Cr, .23 V, 1.25 W, 1.45 Mo
Amalgamated . . . Kro-tung
.33 C, .90 Si, 4.75 Cr, .25 V, 1.30 W, 1.50 Mo
Atlas . . . Crodi
.35 C, .40 Mn, 1.00 Si, 5.00 Cr, .40 V, 1.50 Mo
Bethlehem . . . Cr-Mo-W
.33 C, 1.05 Si, 5.00 Cr, 1.55 W, 1.65 Mo
Braeburn . . . Pressuredie No. 2
.35 C, .35 Mn, 1.00 Si, 5.00 Cr, .35 V, 1.20 W, 1.45 Mo
Carpenter . . . 883
.40 C, .35 Mn, 1.10 Si, 5.00 Cr, .90 V, 1.35 Mo
Crucible . . . Chro-Mow
.30 C, 1.00 Si, 5.00 Cr, 1.25 W, 1.35 Mo
Firth-Sterling . . . HWD
.35 C, .60 Mn, 1.00 Si, 5.00 Cr, .25 V, 1.40 W, 1.55 Mo
Great Western . . . 99
.35 C, .35 Mn, .90 Si, 4.75 Cr, .25 V, 1.10 W, 1.50 Mo
Houghton & Richards . . . Hot Work No. 6
.35 C, .35 Mn, 1.00 Si, 5.00 Cr, 1.35 W, 1.75 Mo
Hoyland . . . 33
.35 C, .35 Mn, .90 Si, 4.75 Cr, .25 V, 1.10 W, 1.50 Mo
Jessop . . . Dica B
.34 C, .35 Mn, .95 Si, 4.85 Cr, .20 V, 1.15 W, 1.50 Mo
Kloster . . . D-C-33
.33 C, .30 Mn, 1.05 Si, 5.00 Cr, 1.55 W, 1.65 Mo
Latrobe . . . LPD
.35 C, .30 Mn, 1.00 Si, 5.00 Cr, 1.50 W, 1.50 Mo
Latrobe . . . MGR
.55 C, .30 Mn, 1.00 Si, 5.00 Cr, 1.00 W, 1.00 Mo

McDonald . . . ML
.35 C, .30 Mn, 1.00 Si, 5.00 Cr, 1.50 W, 1.65 Mo
Milne . . . CMW
35 C, 1.00 Si, 5.00 Cr, 1.30 W, 1.65 Mo
Peninsular . . . Penco-Cr-Mo-W
.33 C, 1.05 Si, 5.00 Cr, 1.55 W, 1.65 Mo
Republic . . . 10-H-W
.35 C, 1.00 Si, 5.00 Cr, 1.25 W, 1.50 Mo
Universal-Cyclops . . . Thermold B
.35 C, .30 Mn, 1.00 Si, 5.00 Cr, .25 V, 1.35 W, 1.60 Mo
Vanadium-Alloys . . . Hotform No. 1
.35 C, .30 Mn, .90 Si, 5.00 Cr, .50 V, 1.40 W, 1.40 Mo
Vulcan-Crucible . . . TCM
.35 C, 1.00 Si, 5.00 Cr, 1.25 W, 1.50 Mo

H-2 . . . 9% TUNGSTEN

SAE Composition: .32 C, .30 Mn, .20 Si, 3.25 Cr, .40 V, 9.00 W
JIC Composition: .28-.35 V, .15-.40 Mn, .20-.50 Si, 3.00-3.50 Cr, .20-.60 V, 8.75-10.00 W, .60 max Mo

Excellent red hardness permits this steel to hold its tempered hardness at temperatures to 1100 F. Suitable for brass forging dies and inserts, extrusion dies, nut punches, permanent molds, extrusion mandrels, and hot trim dies.

Allegheny Ludlum . . . Atlas A
.30 C, .30 Mn, .30 Si, 3.00 Cr, .45 V, 9.00 W
Amalgamated . . . Thermal B
.35 C, 2.75 Cr, .30 V, 9.00 W
Atlas . . . Seneca
.35 C .30 Mn, .30 Si, 3.25 Cr, .40 V, 10.00 W
Bethlehem . . . 57 HW
.35 C, 2.75 Cr, .30 V, 9.00 W
Boyd-Wagner . . EZ 9 W
.40 C, .30 Mn, .20 Si, 3.00 Cr, .25 V, 9.00 W
Braeburn . . . T-Alloy A
.33 C, .25 Mn, .25 Si, 3.50 Cr, .50 V, 9.60 W
Carpenter . . . T-K
.35 C, .30 Mn, .30 Si, 3.50 Cr, .40 V, 9.00 W
Crucible . . . Peerless A
.28 C, 3.25 Cr, .25 V, 9.00 W
Firth-Sterling . . . LT Forging Die
.33 C, .20 Mn, .30 Si, 3.50 Cr, .45 V, 9.50 W
Great Western . . . 310
.30 C, .25 Mn, .30 Si, 3.25 Cr, .35 V, 10.00 W
Houghton & Richards . . . Hot Work No. 2
.33 C, .20 Mn, .30 Si, 3.50 Cr, .50 V, 9.25 W
Hoyland . . . 310
.30 C, .25 Mn, .30 Si, 3.25 Cr, .35 V, 10.00 W
Jessop . . . 2B-LC
.30 C, .30 Mn, .30 Si, 3.10 Cr, .30 V, 10.00 W
Kloster . . . D-C-66
.30 C, .35 Mn, .33 Si, 3.50 Cr, .27 V, 8.75 W
Latrobe . . . CLW
.30 C, .25 Mn, .45 Si, 3.50 Cr, .50 V, 9.00 W
McDonald . . . P-175
.31 C, .29 Mn, .43 Si, 3.30 Cr, .50 V, 9.50 W
Milne . . . 3074
.35 C, 4.00 Cr, .50 V, 9.00 W
Peninsular . . . Penco 57 HW
.35 C, 2.75 Cr, .30 V, 9.00 W
Republic . . . Air Hardening No. 30
.30 C, 3.50 Cr, .25 V, 9.00 W
Simonds . . . D. V. V. Hot Work
.32 C, .30 Mn, .35 Si, 3.25 Cr, .40 V, 9.50 W
Universal-Cyclops . . . B44J
.33 C, .30 Mn, .35 Si, 3.25 Cr, .50 V, 9.50 W, 1.00 max, Mo
Vanadium-Alloys . . . Marvel
.33 C, 3.50 Cr, .50 V, 9.00 W
Vanadium-Alloys . . . Hotpress
.35 C, 2.00 Cr, .50 V, 9.00 W
Vulcan Crucible . . . Calo Ferro .30
.30 C, 3.50 Cr, .25 V, 9.00 W

H-3 . . . CHROME-NICKEL-MOLY

JIC Composition: .50-.60 C, .45-.60 Mn, .15-.35 Si, .70-.80 Cr, .70-.80 Mo, 1.50-1.75 Ni

Die block steel suitable for hammer dies, heading and gripper dies, piercing punches, and die-casting dies.

Atlas . . . Ultimo 6
.55 C, .55 Mn, .25 Si, .75 Cr, .75 Mo, 1.60 Ni
Kloster . . . KLS-44
.57 C, .51 Mn, .28 Si, 1.01 Cr, .92 Mo, 1.43 Ni

H-5 . . . CHROME-MOLY-V

SAE Composition: .35 C, .30 Mn, 1.00 Si, 5.00 Cr, .40 V, 1.50 Mo
JIC Composition: .35-.40 C, .25-.50 Mn, .80-1.20 Si, 5.00-5.50 Cr, .40-60 V, 1.20-1.50 Mo

Better toughness at elevated temperatures than H-2. It is resistant to heat checking when water cooled in operation. Suitable for aluminum and magnesium extrusion and forging dies, punches, die inserts, and shell piercing dies.

Braeburn . . . Pressuredie No. 3-L
.39 C, 1.00 Si, 5.50 Cr, .50 V, 1.10 Mo
Crucible . . . Halcomb 218
.40 C, 105 Si, 5.00 Cr, .35 V, 1.35 Mo
Houghton & Richards . . . Hot Work No. 5
.35 C, .35 Mn, 1.00 Si, 5.00 Cr, .40 V, 1.00 Mo
Latrobe . . . Dycast No. 1
.40 C, 1.00 Si, 5.00 Cr, .50 V, 1.00 Mo
McDonald . . . NLS
.90 C, .60 Mn, .25 Si, 5.20 Cr, .30 V, 1.20 Mo
Peninsular . . . Penco-Cr-Mo-V
40 C, 1.10 Si, 5.25 Cr, .50 V, 1.20 Mo
Universal-Cyclops . . . Thermold A
.35 C, .45 Mn, 1.00 Si, 5.00 Cr, .40 V, 1.35 Mo
Vanadium-Alloys . . . Hotform No. 2
.35 C, .30 Mn, .90 Si, 5.00 Cr, .50 V, 1.40 Mo

H-6 . . . CHROME-MOLY-VV

SAE Composition: .35 C, .30 Mn, 1.00 Si, 5.00 Cr, .90 V, 1.50 Mo
JIC Composition: .35-.40 C. .25-.50 Mn, .80-1.20 Si, 5.00-5.50 Cr, .90-1.15 V, 1.20-1.50 Mo

Higher vanadium content than H-5 gives slightly improved wear resistance. Developed primarily for die casting and plastic molding. Also suitable for forging dies and inserts, punches, piercers, and extrusion tools.

Allegheny Ludlum . . . Potomac M
.40 C, .35 Mn, 1.00 Si, 5.25 Cr, 1.00 V, 1.15 Mo
Bethlehem . . . Cr-Mo-V
..40 C, 1.10 Si, 5.25 Cr, .90 V, 1.20 Mo
Braeburn . . . Pressuredie No. 3
.39 C, 1.00 Si, 5.50 Cr, 1.00 V, 1.10 Mo
Crucible . . . Nu Die V
.40 C, 1.05 Si, 5.00 Cr, 1.10 V, 1.35 Mo
Latrobe . . . VDC
.40 C, .30 Mn, 1.00 Si, 5.00 Cr, 1.00 V, 1.00 Mo
McDonald . . . 33
.40 C, .30 Mn, 1.00 Si, 5.50 Cr, 1.00 V, 1.40 Mo
Peninsular . . . Hi Van
.40 C, 1.10 Si, 5.25 Cr, .90 V, 1.20 Mo
Universal-Cyclops . . . Thermold AV
.35 C, .45 Mn, 1.00 Si, 5.00 Cr, 1.00 V, 1.35 Mo

H-7A . . . 12% TUNGSTEN

Better wear resistance and less toughness than H-2. Good hardness at elevated temperatures. Principal applications in brass industry for extrusions, forging, and die casting.

Allegheny Ludlum . . . Atlas B
.40 C, .30 Mn, .25 Si, 3.00 Cr, .45 V, 12.00 W
Braeburn . . . T-Alloy
.35 C, .25 Mn, .25 Si, 3.50 Cr, .40 V, 10.50 W
Crucible . . . LCT No. 2
.40 C, 2.00 Cr, .35 V, 11.50 W
Houghton & Richards . . Hot Work
.32 C, .28 Si, 3.25 Cr, .40 V, 10.25 W
Jessop . . . 2-B-HC
.49 C, .30 Mn, .30 Si, 2.90 Cr, .35 V, 11.25 W
Jessop . . . 2-B-MC
.39 C, 3.10 Cr, .35 V, 13.30 W
Republic . . . Air Hard No. 40
.45 C, 3.00 Cr, .25 V, 13.00 W

Universal-Cyclops . . . B 44
.35 C, 3.50 Cr, .45 V, 13.00 W
Vulcan Crucible . . . Calo Ferro .45
.45 C, 3.00 Cr, .25 V, 13.00 W

H-8A . . . 15% TUNGSTEN

More wear resistance and less toughness than H-7. Not suitable for battering applications. Suitable for hot shear blades, drawing, and gripper dies, and extrusion dies.

Allegheny Ludlum . . . Mohawk
.45 C, .30 Mn, .30 Si, 3.50 Cr, .70 V, 14.00 W
Bethlehem . . . 57 Spec
.42 C, 3.50 Cr, .30 V, 14.00 W
Boyd-Wagner . . . EZ 14 W
.45 C, .30 Mn, .20 Si, 3.00 Cr, .30 V, 14.00 W
Braeburn . . . T-Alloy B
.50 C, .25 Mn, .25 Si, 3.00 Cr, .50 V, 15.00 W
Braeburn . . . T-Alloy C
.25 C, .25 Mn, .25 Si, 4.00 Cr, .50 V, 15.00 W
Crucible . . . Peerless LLCT
.25 C, 4.00 Cr, .50 V, 15.00 W
Columbia . . . Formite
.35 C, 4.00 Cr, .35 V, 13.50 W, .40 Mo
Darwin & Milner . . . IWI
.45 C, .25 Mn, .30 Si, 4.00 Cr, .70 V, 15.00 W
Firth-Sterling . . . XDL
.38 C, .25 Mn, .30 Si, 4.00 Cr, .45 V, 15.50 W
Great Western . . . 313
.35 C, .30 Mn, .30 Si, 3.00 Cr, 13.50 W
Houghton & Richards . . . Hot Work No. 15
.25 C, .29 Mn, .26 Si, 4.03 Cr, .51 V, 15.10 W
Hoyland . . . 313
.35 C, .30 Mn, .30 Si, 3.00 Cr, 13.50 V
Latrobe . . . CHW
.50 C, 3.00 Cr, .50 V, 15.00 W
Latrobe . . . EHW No. 1
.25 C, .25 Mn, .25 Si, 4.00 Cr, .50 V, 15.00 W
Latrobe . . . PXD
.35 C, 4.00 Cr, 15.00 W, 2.50 Mo, 2.00 Ni
McDonald . . . P-125
.25 C, 4.20 Cr, .50 V, 15.50 W
McDonald . . . P-150
.51 C, 2.90 Cr, .60 V, 15.30 W
McInnes . . . Record A
.50 C, 3.75 Cr, .75 V, 14.00 W
Universal-Cyclops . . . B 4
C as desired, 2.75 Cr, .50 V, 15.00 W
Vanadium-Alloys . . . Forge Die
.25 C, 3.50 Cr, .50 V, 14.00 W

H-9A . . . 18% TUNGSTEN

A lower carbon version of T-1 with better shock resistance but other properties essentially the same. Shock resistance is still quite low for a hot-work steel. Suitable for shear blades, swaging dies, gripper dies, and glass molds.

Atlas . . . Spartan 5
.50 C, .25 Mn, .30 Si, 4.00 Cr, 1.20 V, 18.00 W
Braeburn . . . Vinco
.62 C, .25 Mn, .25 Si, 4.00 Cr, 1.00 V, 18.00 W
Columbia . . . Clarite
C per temper, 4.00 Cr, 1.15 V, 18.00 W
Crucible . . . Rex AA "OX" temper
.63 C, 4.00 Cr, 1.10 V, 18.00 W
Crucible . . . Rex AA "PX" temper
.53 C, 4.00 Cr, 1.10 V, 18.00 W
Disston . . . Kutkwik
.63 or .68 C, 4.00 Cr, 1.00 V, 18.00 W
Firth-Sterling . . . XDH
.58 C, .25 Mn, .35 Si, 4.00 Cr, 1.00 V, 18.00 W
Firth-Sterling . . . XDM
.45 C, .25 Mn, .35 Si, 4.00 Cr, .45 V, 17.50 W
Latrobe . . . Electrite No. 5
.60 C, .25 Mn, .25 Si, 4.00 Cr, 1.00 V, 18.00 W
Universal-Cyclops . . . B-6
C as desired, .25 Mn, .30 Si, 4.00 Cr, 1.10 V, 18.00 W
Vanadium-Alloys . . . Red Cut Superior J Temper
.50 C, .20 Mn, .32 Si, 4.00 Cr, 1.00 V, 18.00 W
Vulcan Crucible . . . Wolfram
.55 C, 4.00 Cr, 1.00 V, 18.00 W

H-10A . . . 2 CHROMIUM, 2 TUNGSTEN

Suitable for die casting and plastic molding dies. Forging temperature 1900 F, annealing 1450 F, hardening 1750 F, tempering 1200 F. Oil quench

McDonald . . . Hardtuf
.50 C, .30 Mn .60 Si, 1.60 Cr, .25 V, 2.60 W
Uddelholm . . . Regin 711
.50 C, .20 Mn, .75 Si, 1.15 Cr, .20 V, 2.50 W
Universal-Cyclops . . . Alco S
.50 C, .30 Mn, 1.00 Si, 1.75 Cr, .25 V, 2.25 W, .50 Mo

H-11A . . . 5 CHROMIUM, 5 TUNGSTEN

Primarily developed for long-run die casting. Also suitable for brass forging, extrusion, and heating. Forging 1950 to 2050 F, annealing 1650 F, hardening 1850 F, tempering 1050 to 1100 F, air or oil quench.

Atlas . . . Red Indian
.35 C, .30 Mn, 1.00 Si, 5.00 Cr, .30 V, 4.00 W, .30 Mo, .50 Co
Braeburn . . . Pressuredie No. 1
.38 C, .30 Mn, .90 Si, 5.00 Cr, .20 V, 5.00 W, .25 Mo .50 Co
Crucible . . . CCS
.40 C, 1.15 Si, 5.25 Cr, 4.25 W
Great Western . . . 515
.35 C, .25 Mn, 1.00 Si, 5.00 Cr, 5.00 W, .20 Mo
Houghton & Richards . . . No. 55
.35 C, .25 Mn, .90 Si, 5.25 Cr, .20 V, 5.25 W, .20 Mo, .50 Co
Hoyland . . . 515
.35 C .25 Mn, 1.00 Si, 5.00 Cr, 5.00 W, .20 Mo
Jessop . . . Dica D
.36 C, .30 Mn, 1.00 Si, 5.00 Cr, 5.00 W, .25 Mo
Latrobe . . . Lumdie
.40 C, 1.00 Si, 5.00 Cr, 4.50 W
McDonald . . . Lensmold
.40 C, .25 Mn, 1.00 Si, 5.25 Cr, 4.65 W
Universal-Cyclops . . . KS
.40 C, .90 Si, 5.25 Cr, 5.25 W

H-12A . . . 7.5 CHROMIUM, 7.5 TUNGSTEN

With its high chromium content, this steel is tougher than the other tungsten steels. Suitable for shear blades, die inserts, forming dies, heading dies, and punches. Forging 1950 to 2000 F, annealing 1650 F, hardening 2000 to 2100 F, tempering 600 to 1300 F. Air or oil quench.

Firth-Sterling . . . WCR
.60 C, .60 Mn, 1.00 Si, 8.50 Cr, 7.50 W
Universal-Cyclops . . . KL
.35 C, .60 Mn, 1.50 Si, 7.50 Cr, 7.50 W
Universal-Cyclops . . . KM
.45 C, .60 Mn, 1.50 Si, 7.50 Cr, 7.50 W
Universal-Cyclops . . . KR
.55 C, .60 Mn, .60 Si, 7.50 Cr, 7.50 W

H-13A . . . 12 CHROMIUM, 12 TUNGSTEN

Suitable for brass extrusion and forging dies. Forging temperature 2150 F, annealing 1550 F, hardening 2300 F, tempering 1300 F. Oil quench.

Crucible . . . Halcomb 236
.30 C, .35 Mn, .50 Si, 12.00 Cr, .90 V, 12.00 W
Firth-Sterling . . . BDC
.33 C, .35 Mn, .35 Si, 12.00 Cr, 1.05 V, 12.00 W
Latrobe . . . Kalkas
.30 C, 12.00 Cr, 1.00 V, 12.00 W
Universal-Cyclops . . . Thor
.30 C, .30 Mn, .50 Si, 12.00 Cr, 1.00 V, 12.00 W

H-14A . . . 1% CHROMIUM

Suitable for short-service die-casting dies or plastic mold dies.

Crucible . . . CSM-2
.30 C, .75 Mn, .50 Si, .80 Cr, .25 Mo
Jessop . . . Dica A
.42 C, .75 Mn, .25 Si, 1.00 Cr, .20 Mo
Latrobe . . . ZTM
.35 C, .80 Mn, .55 Si, .80 Cr, .30 Mo

McDonald . . . 99
.35 C, .80 Mn, .60 Si, .85 Cr, .35 Mo
Vanadium-Alloys . . . Speed-Cut
.40 C, .90 Mn, 1.10 Cr, .50 Mo

H-15A . . . 2½% CHROMIUM

Suitable for short-service die-casting dies.

Latrobe . . . Aldivan
.45 C, .65 Mn, .25 Si, 2.50 Cr, .30 V

H-16A . . . 4% CHROMIUM

Designed for hot forming by hydraulic or compressive methods with heavy pressure while in contact with the hot metal. Will stand water cooling in operation. Forging temperature 1800 F, annealing 1500 F, hardening 1700 to 1800 F, tempering 600 to 1000 F. Air or oil quench.

Allegheny Ludlum . . . EB
.70 C, .30 Mn, 3.75 Cr, .55 V, .70 Mo
Crucible . . . La Belle 89
.55 C, 3.90 Cr, .90 V, .45 Mo
Firth-Sterling . . . CYW Choice
.95 C, .50 Mn, 3.60 Cr
Heller . . . Brown Label
.90 C, .35 Mn, .25 Si, 3.50 Cr
Houghton & Richards . . . Hot Work No. 4
.97 C, .35 Mn, .35 Si, 3.90 Cr
Jessop . . . J
.62 C, .30 Mn, .35 Si, 3.80 Cr, .55 V, .55 Mo
Jessop . . . JJ
.62 C, .30 Mn, .35 Si, 3.80 Cr, .55 V, .55 Mo
Latrobe . . . Select M
.90 C, 3.50 Cr, .20 V, .60 Mo
Republic . . . 6-H-W
.60 C, 4.00 Cr, .75 V, .45 Mo
Republic . . . XX
.90 C, 4.00 Cr, .75 V, 45 Mo
Universal-Cyclops . . . Ajax No. 2
1.00 C, 4.25 Cr, .50 V, .45 Mo
Vanadium-Alloys . . . Choice
1.00 C, 4.00 Cr
Vulcan Crucible . . . 6-H-W
.60 C, 4.00 Cr, .75 V, .45 Mo
Vulcan Crucible . . . 4-H-W
.90 C, 4.00 Cr, .75 V, .45 Mo

H-17A . . . 1% MOLYBDENUM

A tough steel with resistance to heat checking. Suitable for hot header dies, upset punches, extrusion dies, and press forging dies. Forging temperature 1900 to 2100 F, annealing 1450 F, hardening 1650 to 1750 F, tempering 900 to 1300 F. Oil quench.

Republic . . . 550
.45 C, .65 Mn, 1.60 Cr, .25 V, 1.10 Mo
Vulcan Crucible . . . A-41
.45 C, 1.60 Cr, .25 V, 1.10 Mo

H-18A . . . 2% MOLYBDENUM

Combines red hardness and toughness. Suitable for punches, mandrels, forming and forging dies, extrusion and swaging dies, shear knives, and die-casting dies and plastic molds. Forging 1950 to 2150 F, annealing 1450 to 1550 F, hardening 1800 to 1900 F, tempering 950 to 1200 F.

Amalgamated . . . Kropunch
.40 C, 1.10 Si, 5.00 Cr, .30 V, 2.50 W, 2.00 Mo

H-19A . . . 5% MOLYBDENUM

Low-carbon version of M-2. Suitable for extrusion dies, header inserts, and bolt trimmers.

Latrobe . . . Electrite No. 7
.65 C, 4.00 Cr, 2.00 V, 6.50 W, 5.00 Mo

H-20A . . . 8% MOLYBDENUM

Low-carbon version of M-1. Suitable for high operating temperatures.

Bethlehem . . . HW 8
.60 C, 3.60 Cr, 1.75 V, 8.50 Mo
Houghton & Richards . . . Molyhi
C per temper, 4.00 Cr, 1.15 V, 1.50 W, 8.50 Mo
Universal-Cyclops . . . Mo Tung
C per temper .25 Mn, .30 Si, 4.00 Cr, 1.15 V 1.50 W, 8.50 Mo

H-21A . . . NICKEL-TUNGSTEN

Modified form of H-2 with low carbon and an appreciable nickel content. Suitable for piercing heads, die-casting dies for copper alloys, dummy blocks, and forming dies. Forging 2000 to 2200 F, annealing 1600 F, hardening 2000 to 2300 F, tempering 1000 to 1300 F. Oil or air quench.

Firth-Sterling . . . LTL
.25 C, .25 Mn, .20 Si, 2.75 Cr, .25 V, 10.00 W, 1.50 Ni
Republic . . . Resco
.28 C, 2.75 Cr, 9.50 W, .25 Mo, 1.75 Ni
Uddeholm . . . Valand 1
.30 C, .30 Mn, .30 Si, 3.00 Cr, .30 V, 9.50 W, 1.75 Ni
Universal-Cyclops . . . K 390
.24 C, .40 Mn, .40 Si, 2.75 Cr, 10.00 W, 2.00 Ni

H-22A . . . COBALT-TUNGSTEN

Maintains shock and wear resistance at elevated temperatures. Suitable for brass extrusion tools, press forging dies, and hot punches. Forging 1900 to 2100 F, annealing 1600 to 1650 F, hardening 2100 to 2250 F, tempering 900 to 1300 F. Air or oil quench.

Allegheny Ludlum . . . B-47 Hot Die
.40 C, .35 Mn, .25 Si, 4.25 Cr, 2.25 V, 4.25 W, .40 Mo, 4.25 Co
Uddeholm . . . Valand 2
.32 C, .30 Mn, .30 Si, 2.50 Cr, .35 V, 8.00 W, 2.00 Co

H-23A . . . CHROME-SILICON

Suitable for hot-work dies and plastic-mold dies. Forging temperature 1600 to 1950 F, annealing 1500 F, hardening 1650 to 1750 F, tempering 350 to 600 F. Oil quench.

Houghton & Richards . . . MYA
.42 C, .30 Mn, 1.45 Si, 1.45 Cr, .25 V

HUBBING STEELS

P-1 . . . STRAIGHT IRON

JIC Composition: .10 max C, .20 max Mn, .20 Max Si, .05-.15 V opt

A case-hardening mold steel for cold-hubbed cavities. Annealing temperature 1550 to 1600 F, Carburize at 1600 to 1650 F, reheat to 1425 to 1450 F and quench in water or brine. Temper at 300 F.

Bethlehem . . . Duramold C
.10 C, .15 Mn, .10 Si
Carpenter . . . Mirromold
.10 C, .20 Mn, .10 V
Crucible . . . Crusca
.05 C, .15 Mn
Great Western . . . Rema
.05 C, .20 Mn .10 Si
Hoyland . . . Rema
.05 C, .20 Mn, .10 Si
Latrobe . . . LCX
.05 max C, .03 max Cr
McDonald . . . Hobomold
.04 C, .20 Mn, .16 Si
Peninsular . . . Hob-A-Form
.06 max C, .15 Mn, .10 max Si
Republic . . . Plastic Die
.08 max C, .10 max Mn
Uddeholm . . . UHB Forma
.05 C, .10 Mn, .10 Si

Vulcan Crucible . . . Plastic Die
.07 C.

P-2 . . . CHROME-NICKEL-MOLY

JIC Composition: .07 max C, .30-.50 Mn, .10-.25 Si, 1.20-1.50 Cr, .15-.25 Mo .40-.70 Ni

Higher core strength than P-1, but not quite as good hubability. Forging 1900 to 2000 F, annealing 1450 F, carburizing 1650 F, hardening 1525 to 1550 F, tempering 350 to 400 F. Oil quench.

Crucible . . . Formold
.07 max C, 1.35 Cr, .20 Mo .55 Ni
Vulcan Crucible . . . Vulmold
.10 max C, .30 Mn, 1.40 Cr, .25 Mo, .52 Ni

P-3 . . . NICKEL ALLOY

JIC Composition: .10 max C, .30-.60 Mn, .15-.30 Si, .50-.75 Cr, 1.10-1.40 Ni

Properties similar to P-2. Carburize and oil quench.

Great Western . . . Remalloy
.10 C, .50 Mn, .40 Si, .65 Cr, 1.50 Ni
Hoyland . . . Remalloy
.10 C, .50 Mn, .40 Si, .65 Cr, 1.50 Ni
Peninsular . . . Pen Hob
.10 max C, .50 Mn, .60 Cr, 1.25 Ni

P-4 . . . 5% CHROME AIR HARD

JIC Composition: .07 C typ, .40 Mn typ, .25 Si typ, 4.50 Cr typ.

Better core strength and hubability than P-2 or P-3. Best safety in hardening and good wear resistance. Suitable not only for plastic molds, but for zinc and aluminum die casting. Forging 2000 to 2050 F, annealing 1600 F, carburizing 1725 to 1750 F, tempering 800 F. Air quench.

Carpenter . . . Super Samson
.10 C, .30 Mn, .20 Si, 5.00 Cr, .25 V, .90 Mo
Crucible . . . Airmold
.07 max C, 5.00 Cr, .50 Mo
Peninsular . . . Penco ACS
.07 C, .40 Mn, .25 Si, 4.50 Cr

P-5A . . . CHROME-NICKEL

High core strength. Can be hubbed slightly but not suitable for deep hubbing. Good machinability. Forging 1900 to 2000 F. carburizing 1625 F, hardening 1450 F, tempering 300 F. Oil quench.

Carpenter . . . No. 158
.10 C, .40 Mn, 1.50 Cr, 3.50 Ni
Crucible . . . Crusco 12-B
.10 C, .50 Mn, 1.60 Cr, 3.50 Ni

P-6A . . . NICKEL-VANADIUM

An age hardening die-casting steel for zinc die casting and plastic molds.

Latrobe . . . Cascade
.14 C, .12 Cr, .50 V, 4.00 Ni

P-7A . . . 2% CHROMIUM

Good hubability and high strength. Annealing temperature 1600 F, process annealing 1325 F, carburizing 1600 F, tempering 200 to 300 F. Water or brine quench.

Carpenter . . . Samson Extra
.10 C, .30 Mn, .20 Si, 2.30 Cr

P-8A . . . 13% CHROMIUM

Shallow hubbing is possible after a special anneal. For maximum corrosion resistance harden at 1800 to 1900 F. Temper at 300 to 400 F.

Carpenter . . . Stainless No. 2 Mold steel
.30 C, 13.00 Cr.

TUNGSTEN HIGH-SPEED TOOL STEELS

T-1 . . . TUNGSTEN, 18-4-1

SAE Composition: .70 C, .30 Mn, .30 Si, 4.10 Cr, 1.10 V, 18.00 W

JIC Composition: .68-.75 C, .15-.35 Mn, .20-.40 Si, 3.75-4.25 Cr, 1.00-1.25 V, 17.50-18.50 W, 1.00 max Mo, .50 max residuals

A general-purpose high-speed steel with a balanced combination of shock resistance and abrasion resistance. It is the easiest high-speed grade to machine. Has high red hardness. Principal application is cutting tools. In a lower carbon range it is listed under H-9A.

Allegheny Ludlum . . . LXX
.70 C, .25 Mn, .25 Si, 4.00 Cr, 1.00 V, 18.00 W
Amalgamated . . . Malax AA
.73 C, 4.00 Cr, 1.10 V, 18.00 W
Atlas . . . Spartan 7
.72 C, .25 Mn, .30 Si, 4.00 Cr, 1.20 V, 18.00 W
Bethlehem . . . Special HS
.73 C, 4.00 Cr, 1.10 V, 18.00 W
Boyd-Wagner . . . Record Superior
.70 C, .30 Mn, .20 Si, 4.00 Cr, 1.00 V, 18.00 W, .30 Co
Braeburn . . . Vinco
.70 C, .25 Mn, .25 Si, 4.00 Cr, 1.00 V, 18.00 W
Carpenter . . . Star Zenith
.72 C, .25 Mn, .20 Si, 4.00 Cr, 1.15 V, 18.25 W
Columbia . . . Clarite
.72 C, .25 Mn, .30 Si, 4.00 Cr, 1.15 V, 18.00 W
Craine-Schrage . . . Crasco High Speed
.70 C, .35 Mn, .30 Si, 4.15 Cr, 1.15 V, 18.00 W
Crucible . . . Rex AA
.73 C, 4.00 Cr, 1.15 V, 18.00 W
Darwin & Milner . . . Cannon
.70 C, .25 Mn, .35 Si, 4.00 Cr, 1.00 V, 18.00 W
Diehl . . . Blue Streak
.72 C, 4.00 Cr, 1.00 V, 18.00 W
Disston . . . Kutkwik
.73 or .78 C, 4.00 Cr, 1.00 V, 18.00 W
Firth-Sterling . . . Blue Chip
.72 C, .25 Mn, .20 Si, 4.10 Cr, 1.15 V, 18.20 W
Great Western . . . Silver Stripe
.70 C, .20 Mn, .30 Si, 4.00 Cr, 1.00 V, 18.00 W
Houghton & Richards . . . No. 1
.70 C, .20 Mn, .30 Si, 4.00 Cr, 1.00 V, 18.00 W
Hoyland . . . 18-4-1
.70 C, .20 Mn, .30 Si, 4.00 Cr, 1.00 V, 18.00 W
Jessop . . . Supremus
.73 C, .28 Mn, .28 Si, 4.00 Cr, 1.10 V, 18.00 W
Kloster . . . Clipper
.65 C, .27 Si, 4.02 Cr, 1.07 V, 18.12 W
Latrobe . . . Electrite No. 1
.72 C, .25 Mn, .25 Si, 4.00 Cr, 1.00 V, 18.00 W
McDonald . . . Superior
.75 C, .28 Mn, .22 Si, 4.00 Cr, 1.00 V, 18.00 W
McInnes . . . "V" High Speed
.75 C, 4.00 Cr, 1.10 V, 18.50 W
Milne . . . AMC
4.00 Cr, 1.00 V, 18.00 W
Peninsular . . . Penco XX
.72 C, .25 Mn, .30 Si, 4.00 Cr, 1.10 V, 18.00 W
Republic . . . B-F High Speed
.72 C, .30 Mn, 4.00 Cr, 1.00 V, 18.00 W
Simonds . . . Red Streak
.72 C, 4.00 Cr, 1.00 V, 18.00 W
Universal-Cyclops . . . B 6
.75 C, .25 Mn, .30 Si, 4.00 Cr, 1.10 V, 18.00 W
Vanadium-Alloys . . . Red Cut Superior
.72 C, .20 Mn, 30 Si, 4.00 Cr, 1.00 V, 18.00 W
Vulcan Crucible . . . Wolfram
.71 C, 4.00 Cr, 1.00 V, 18.00 W

T-2 . . . TUNGSTEN, 18-4-2

SAE Composition: .80 C, .30 Mn, .30 Si, 4.10 Cr, 2.10 V, 18.50 W, .80 Mo

JIC Composition: .80-.85 C, .15-.35 Mn, .20-.40 Si, 4.00-4.75 Cr, 2.00-2.50 V, 18.00-19.00 W, 1.00 max Mo, .50 max residuals

With higher carbon and vanadium content than T-1 and a small molybdenum addition, this steel provides a harder and more durable tool edge. Often more economical than cobalt steels, it hardens without a soft skin. Not as tough as T-1. Suitable for fine-edge tools such as hobs and threading dies, form tools, twist drills, reamers, broaches, and milling cutters.

Allegheny Ludlum . . . ML
.82 C, .30 Mn, .30 Si, 4.10 Cr, 2.10 V, 18.50 W, .75 Mo

Atlas . . . Trojan
.80 C, .25 Mn, .30 Si, 4.00 Cr, 2.00 V, 18.50 W, .50 Mo.

Braeburn . . . Twinvan
.82 C, .25 Mn, .25, Si, 4.25 Cr, 2.10 V, 18.50 W, .65 Mo

Crucible . . . Rex Supervan
.85 C, 4.00 Cr, 2.10 V, 18.50 W, .75 Mo

Firth-Sterling . . . HV Blue Chip
82 C, .25 Mn, .30 Si, 4.25 Cr, 2.10 V. 18.50 W, .65 Mo

Houghton & Richards . . . No. 2
.80 C, .35 Si, 4.25 Cr, 2.15 V, 18.50 W, .65 Mo

Jessop . . . Supremus Extra
.73 C, .28 Mn, .28 Si, 4.00 Cr, 2.00 V, 18.00 W

Kloster . . . Prior
.81 C, .30 Mn, .35 Si, 4.25 Cr, 2.12 V, 18.50 W, .65 Mo

Latrobe . . . Electrite No. 19
.83 C, .25 Mn, .25 Si, 4.10 Cr, 2.20 V, 18.50 W, .60 Mo

Milne . . . Milvan
4.10 Cr, 2.25 V, 19.00 W

Republic . . . IXL High Speed
.80 C, .30 Mn, 4.00 Cr, 2.00 V, 19.00 W, .75 Mo

Simonds . . . Lockport Special
.80 C, 4.25 Cr, 2.25 V, 18.50 W, .70 Mo

Universal Cyclops . . . B 9
.84 C, .25 Mn, .30 Si, 4.25 Cr, 2.25 V, 18.50 W, .50 Mo

Vanadium-Alloys . . . EVM
.85 C, .25 Mn, .35 Si, 4.25 Cr, 2.00 V, 18.10 W

Vulcan Crucible . . . Super
.80 C, 4.25 Cr, 2.25 V, 18.50 W, .70 Mo

T-3 . . . TUNGSTEN, 18-4-3

SAE Composition: 1.05 C, .30 Mn, .30 Si, 4.10 Cr, 3.25 V, 18.50 W

JIC Composition: 1.00-1.10 C, .15-.35 Mn, .20-.40 Si, 4.00-4.75 Cr, 3.00 min V, 18.00-19.00 W, 1.00 max Mo, .50 max residuals

The triple vanadium and high carbon content of this steel provide the highest wear resistance of any tool steel. It is suitable for cutting hard wrought metals or castings, material that work hardens, and soft, gummy materials where wear resistance is a major factor.

Bethlehem . . . Red Tiger
1.00 C, 4.50 Cr, 2.65 V, 18.50 W, .65 Mo

Houghton & Richards . . . No. 3
1.04 C, .26 Mn, .27 Si, 4.18 Cr, 3.41 V, 18.46 W, .84 Mo

Latrobe . . . Electrite Vanadium
1.10 C, .25 Mn, .25 Si, 4.10 Cr, 3.40 V, 18.50 W, .85 Mo

Peninsular . . . Penco XXX
1.05 C, .25 Mn, .30 Si, 4.35 Cr, 3.00 V, 18.50 W

T-4 . . . COBALT-TUNGSTEN 18-4-1-5

SAE Composition: .75 C, .30 Mn, .30 Si, 4.10 Cr, 1.00 V, 18.00 W, .80 Mo, 5.00 Co

The addition of 5% cobalt to T-1 increases cutting ability at high temperatures, making this steel suitable for machining abrasive materials and for hogging cuts where high heats develop. Requires higher hardening temperature and so tends to develop a soft skin. Should be used where tools are well supported, not subject to shock, and ground all over after hardening. This steel was classified T-16 in Part I of this report. The original Gorham T-4 calls for 4% cobalt, but general practice is to place the 5% cobalt version of T-1 in this category.

Allegheny Ludlum . . . Panther Special
.75 C, .25 Mn, .25 Si, 4.50 Cr, 1.00 V, 19.00 W, 5.00 Co

Amalgamated . . . Malax AAA
.74 C, 4.50 Cr, 1.25 V, 18.50 W, .75 Mo, 5.00 Co

Atlas . . . Powhatan
.75 C, .25 Mn, .30 Si, 4.00 Cr, 1.25 V, 19.00 W, 5.00 Co

Bethlehem . . . Comokut
.74 C, 4.50 Cr, 1.25 V, 18.50 W, .75 Mo, 5.00 Co

Braeburn . . . Cobalt
.74 C, .25 Mn, .25 Si, 4.00 Cr, 1.00 V, 18.00 W, .80 Mo, 5.00 Co

Crucible . . Rex AAA
.75 C, 4.00 Cr, 1.15 V, 18.00 W, .75 Mo, 5.00 Co

Darwin & Milner . . . 505
70 C, .30 Mn, .25 Si, 4.00 Cr, 1.15 V, 18.00 W, .60 Mo, 5.00 Co

Firth-Sterling . . . Red Chip
.75 C, .25 Mn, .30 Si, 4.00 Cr, 1.00 V, 18.00 W, .75 Mo, 5.00 Co

Great Western . . . Super-Kut
.70 C, .25 Mn, .30 Si, 4.00 Cr, 1.00 V, 18.00 W, .50 Mo, 5.00 Co

Houghton & Richards . . . Cobalt
.78 C, 4.00 Cr, 1.00 V, 18.00 W, 5.00 Co

Hoyland . . . Cobalt 5
.70 C, .25 Mn, .30 Si, 4.00 Cr, 1.00 V, 18.00 W, .50 Mo, 5.00 Co

Jessop . . . Purple Label
.74 C, .28 Mn, .28 Si, 4.20 Cr, 1.10 V, 18.50 W, .50 Mo, 5.00 Co

Latrobe . . . Electrite Cobalt
.72 C, .25 Mn, .25 Si, 4.00 Cr, 1.00 V, 18.00 W, .65 Mo, 5.00 Co

Milne . . . Hyco
4.25 Cr, 1.30 V, 18.50 W, 5.00 Co

Universal-Cyclops . . . B 7
.75 C, .25 Mn, .30 Si, 4.25 Cr, 1.10 V, 18.00 W, .80 Mo, 5.00 Co

Republic . . . Cobalt High Speed
.72 C, 4.00 Cr, 1.00 V, 18.00 W, .50 Mo, 5.00 Co

Simonds . . . Tunco
.73 C, 4.50 Cr, 1.10 V, 19.00 W, 5.00 Co

Vanadium-Alloys . . . Red Cut Cobalt
.73 C, .20 Mn, .30 Si, 4.25 Cr, 1.08 V, 18.25 W, .65 Mo, 4.75 Co

Vulcan Crucible . . . Wolfram Cobalt
.72 C, 4.00 Cr, 1.00 V, 18.00 W, .50 Mo, 5.00 Co

T-5 . . . COBALT-TUNGSTEN 18-4-2-8

SAE Composition: .80 C, .30 Mn, .30 Si, 4.10 Cr, 1.75 V, 18.50 W, .80 Mo, 8.00 Co

JIC Composition: .75-.85 C, .15-.35 Mn, .20-.40 Si, 4.00-4.75 Cr, 1.25-2.25 V, 18.00-19.00 W, 1.00 max. Mo, 7.50 min Co, .50 Max residuals

An intermediate cobalt steel with high red hardness and good wear resistance. Cutting speeds can be about 25% faster than with T-1 with longer tool life. Suited for heavy, dry cuts and for machining heat-treated forgings and castings.

Allegheny Ludlum . . . Super Panther
.80 C, .25 Mn, .25 Si, 4.25 Cr, 2.00 V, 19.00 W, 1.00 Mo 7.25 Co

Amalgamated . . . Malax AAAA
.80 C, 4.25 Cr, 2.00 V, 19.00 W, 1.00 Mo, 7.25 Co

Atlas . . . Nipigon
.78 C, .25 Mn, .30 Si, 4.00 Cr, 2.00 V, 19.00 W, .80 Mo, 8.00 Co

Boyd-Wagner . . . Record Eminent
.75C, .30 Mn, .20 Si, 5.00 Cr, 1.50 V, 18.50 W, 8.50 Co

Braeburn . . . Bonded Carbide Jr.
.77 C, .25 Mn, .25 Si, 4.25 Cr, 1.95 V, 18.50 W, .75 Mo, 7.60 Co

Crucible . . . Rex Supercut
.80 C, 4.00 Cr, 2.00 V, 18.50 W, .60 Mo, 8.00 Co

Darwin & Milner . . . 505 Special
.80 C, .30 Mn, .25 Si, 4.00 Cr, 2.00 V, 18.00 W, .80 Mo, 8.00 Co

Firth-Sterling . . . Circle C
.77 C, .25 Mn, .25 Si, 4.50 Cr, 1.90 V, 18.50 W, 1.00 Mo, 9.00 Co

Houghton & Richards . . . No. 4
.80 C, 4.50 Cr, 1.75 V, 18.50 W, .80 Mo, 7.50 Co

Jessop . . . Purple Label Extra
.78 C, .28 Mn, .28 Si, 4.20 Cr, 1.95 V, 18.50 W, .75 Mo, 7.90 Co

Latrobe . . . Electrite Super Cobalt
.83 C, .25 Mn, .30 Si, 4.00 Cr, 2.00 V, 18.00 W, 9.00 Co

McInnes . . . Duro
.80 C, 4.00 Cr, 18.50 W, 4.00 Mo, 7.00 Co

Milne . . . Milco 9
.80 C, .30 Mn, .30 Si, 4.25 Cr, 1.75 V, 18.50 W, .75 Mo, 9.00 Co

Simonds . . . Super Cobalt
.75 C, 4.25 Cr, 2.00 V, 18.50 W, .60 Mo, 7.75 Co

Universal Cyclops . . . B 10
.80 C, .25 Mn, .30 Si, 4.50 Cr, 2.00 V, 18.50 W, 1.00 Mo, 9.00 Co

Vanadium-Alloys . . . Red Cut Cobalt B
.78 C, .25 Mn, .30 Si, 4.25 Cr, 1.85 V, 18.50 W, .75 Mo, 8.75 Co

T-6 . . . COBALT-TUNGSTEN, 18-4-2-12

SAE Composition: .80 C, .30 Mn, .30 Si, 4.10 Cr, 1.75 V, 20.00 W, .80 Mo, 12.00 Co

A high-cobalt steel having the highest red hardness of any tool steel. Wear resistance is better than the lower cobalt steels. Suitable for heavy duty lathe and planer tools. Careful heat-treating practice is essential and salt baths or controlled atmospheres desirable.

Braeburn . . . Bonded Carbide
.70 C, .25 Mn, .25 Si, 4.50 Cr, 1.50 V, 18.00 W, .70 Mo, 12.00 Co

Crucible . . . Rex 440
.80 C, 4.00 Cr, 2.00 V, 19.50 W, .60 Mo, 12.00 Co

Houghton & Richards . . . Super Cobalt
.80 C, .20 Mn, .32 Si, 4.25 Cr, 1.35 V, 20.50 W, .60 Mo 12.25 Co

Latrobe . . . Electrite Ultra Cobalt
.83 C, .25 Mn, .25 Si, 4.00 Cr, 2.00 V, 18.00 W, .80 Mo, 12.00 Co

McDonald . . . Enormous
.83 C, .25 Mn, .27 Si, 4.50 Cr, 2.00 V, 22.00 W, 1.00 Mo, 10.00 Co

Milne . . . Major
4.50 Cr 1.80 V, 21.00 W, .75 Mo, 13.00 Co

Vanadium-Alloys . . . Gray Cut Cobalt
.80 C, .25 Mn, .30 Si, 4.25 Cr, 1.60 V, 20.50 W, .60 Mo, 12.25 Co

T-7 . . . TUNGSTEN, 14-4-2

Lowered tungsten content gives increased toughness with less wear resistance. Suitable for intermittent cutting and for sand castings, hard alloys, or gritty materials. Forging 1900 to 2000 F, annealing 1650 F, hardening 2325 to 2350 F. Double temper 2 hr at 1050 F.

Boyd-Wagner . . . Bowco One Star
.70 C, .35 Mn, .20 Si, 4.00 Cr, 2.00 V, 14.00 W

Crucible . . . Rex Champion
.73 C, 4.00 Cr, 2.00 V, 14.00 W

Latrobe . . . Electrite U
.70 C, 4.00 Cr, 2.00 V, 14.00 W

T-8 . . . COBALT-TUNGSTEN, 14-4-2-5

SAE Composition: .80 C, .30 Mn, .30 Si, 4.10 Cr, 2.00 V, 14.00 W, .80 Mo, 5.00 Co

Wear resistence exceeded only by T-3 combined with good red hardness make this steel suitable for severe cutting operations, especially stainless steels. It has also given good results on hard die blocks, manganese steel castings, and chilled cast iron.

Columbia . . . Maxite
.73 C, .25 Mn, .30 Si, 4.00 Cr, 2.15 V, 14.00 W, .60 Mo, 4.75 Co

Crucible . . . Rex 95
.80 C, 4.00 Cr, 2.00 V, 14.00 W, .75 Mo, 5.25 Co

Firth-Sterling . . . FS 2-5
.80 C, 4.00 Cr, 2.00 V, 14.00 W, .75 Mo, 5.25 Co

Kloster . . . Cobalt
.76 C, .27 Mn, .25 Si, 4.25 Cr, 2.25 V, 14.00 W, .50 Mo, 5.00 Co

Latrobe . . . Electrite UB
.75 C, .30 Mn, .25 Si, 4.00 Cr, 2.00 V, 14.00 W, .50 Mo, 5.00 Co

Universal-Cyclops . . . B 8
.78 C, .25 Mn, .30 Si, 4.25 Cr, 2.25 V, 14.00 W. .50 Mo, 5.00 Co

T-15 . . . COBALT-TUNGSTEN, 13-4-5-5

High-vanadium steel for maximum abrasive resistance, principal application is for cutting tools, Annealing temperature 1625 F, hardening 2270 F, tempering 1000 to 1200 F.

Latrobe . . . Electrite UB 4
1.50 C, 4.00 Cr, 5.00 V, 14.00 W, 5.00 Co

Vanadium-Alloys . . . Vasco Supreme
1.50 C, .25 Mn, .25 Si, 4.75 Cr, 5.00 V, 12.50 W, 5.00 Co

T-16 . . . SEE T-4

T-17A . . . TUNGSTEN, 14-4-3

A tough high-speed steel designed for high resistance to impact. Suitable for variable cutting, such as turning, through scale and broaching. Forging temperature 1900 to 2000 F, annealing 1650 F, hardening 2275 to 2325 F, double temper 2 hr at 1000 to 1050 F.

Crucible . . . Rex 3-V
1.00 C, 4.00 Cr, 3.00 V, 14.00 W, .75 Mo

T-18A . . . TUNGSTEN, 18-4-4

A high-vanadium steel for extremely abrasive conditions. Runs best at high speeds with light cuts. Forging temperature 1950 to 2050 F, annealing 1650 F, hardening 2275 to 2325 F, double temper 2 hr at 1000 to 1050 F.

Crucible . . . Rex 4-V
1.25 C, 4.00 Cr, 4.00 V, .75 Mo, 18.50 W

MOLYBDENUM HIGH-SPEED TOOL STEELS

M-1 . . . MOLYBDENUM, 8-2-1

SAE Composition: .80 C, .30 Mn, .30 Si, 4.00 Cr, 1.15 V, 1.50 W, 8.50 Mo

JIC Composition: .78-.84 C, .15-.40 Mn, .25-.50 Si, 3.50-4.00 Cr, 1.00-1.30 V, 1.30-2.00 W, 8.20-9.40 Mo, .50 max residuals

A general-purpose high-speed steel that can be substituted for T-1 for many applications. It is cheaper and has a lower hardening temperature, but requires more care in heating to avoid decarburization. Both toughness and wear resistance are slightly better than T-1.

Allegheny Ludlum . . . LMW
.80 C, .25 Mn, .35 Si, 3.75 Cr, 1.20 V, 1.65 W, 8.75 Mo

Atlas . . . Mohican
.80 C, .25 Mn, .30 Si, 4.00 Cr, 1.20 V, 1.50 W, 9.00 Mo

Bethlehem . . . HM
.78 C, 3.85 Cr, 1.05 V, 1.60 W, 8.50 Mo

Braeburn . . . Mocut
.80 C, .25 Mn, .25 Si, 4.00 Cr, 1.10 V, 1.55 W, 8.00 Mo

Crucible . . . Rex TMO
.80 C, 3.75 Cr, 1.15 V, 1.55 W, 8.70 Mo

Disston . . . Di-Mol
.85 C, 3.75 Cr, 1.00 V, 1.50 W, 9.00 Mo

Firth-Sterling . . . Hi Mo
.81 C, 3.80 Cr, 1.15 V, 1.65 W, 8.80 Mo
Houghton & Richards . . . Molyhi
.80 C, 4.00 Cr, 1.15 V, 1.50 W, 8.50 Mo
Jessop . . . Mogul
.80 C, .25 Mn, .30 Si, 3.80 Cr, 1.15 V, 1.50 W, 8.70 Mo
Latrobe . . . Electrite Tatmo
.80 C, .25 Mn, .25 Si, 4.00 Cr, 1.00 V, 1.50 W, 8.00 Mo
McDonald . . . Super Moly
.80 C, .25 Mn, .24 Si, 3.90 Cr, 1.10 V, 1.70 W, 8.80 Mo
Peninsular . . . Penco Hi Moly
.81 C, .25 Mn, .35 Si, 3.75 Cr, 1.15 V, 1.65 W, 8.60 Mo
Simonds . . . STM
.80 C, 3.75 Cr, 1.25 V, 1.50 W, 8.75 Mo
Universal-Cyclops . . . Mo Tung
.80 C, .25 Mn, .30 Si, 4.00 Cr, 1.15 V, 1.50 W, 8.50 Mo
Vanadium-Alloys . . . 8-N-2
.79 C, .20 Mn, .25 Si, 3.75 Cr, 1.10 V, 1.50 W, 8.60 Mo

M-2 . . . MOLYBDENUM-TUNGSTEN, 6-6-2

SAE Composition: .83 C, .30 Mn, .30 Si, 4.10 Cr, 1.90 V, 6.25 W, 5.00 Mo

JIC Composition: .79-.86 C, .35 max Mn, .40 max Si, 3.90-4.40 Cr, 1.75-2.05 V, 6.00-6.75 W, 4.75-5.25 Mo, .50 max residuals

A general-purpose high-speed steel with higher red hardness than M-1. There is less difficulty with decarburization than in the higher molybdenum steels, but controlled atmospheres or salt baths are desirable. Especially suitable for taps, reamers, twist drills, broaches, milling cutters, and lathe and planer tools.

Allegheny Ludlum . . . DBL-2
.82 C, .25 Mn, .30 Si, 4.25 Cr, 1.90 V, 6.40 W, 6.00 Mo
Amalgamated . . . Malax A
.83 C, 4.15 Cr, 1.90 V, 6.35 W, 5.00 Mo
Atlas . . . Sixix
.82 C, .25 Mn, .30 Si, 4.00 Cr, 2.00 V, 6.50 W, 5.00 Mo
Bethlehem . . . 66HS
.83 C, 4.15 Cr, 1.90 V, 6.35 W, 5.00 Mo
Boyd-Wagner . . . Record 66
.80 C, .30 Mn, .20 Si, 4.50 Cr, 1.50 V, 5.50 W, 4.50 Mo
Braeburn . . . Braemow M-2
.82 C, .25 Mn, .25 Si, 4.20 Cr, 1.90 V, 6.50 W, 5.00 Mo
Carpenter . . . Speed Star
.82 C, .25 Mn, .25 Si, 4.25 Cr, 1.90 V, 6.25 W, 5.00 Mo
Columbia . . . Molite
.82 C, .25 Mn, .30 Si, 4.15 Cr, 1.90 V, 6.50 W, 5.00 Mo
Crucible . . . Rex M-2
.83 C, 4.15 Cr, 1.90 V, 6.40 W, 5.00 Mo
Darwin & Milner . . . MT-6
.85 C, .25 Mn, .25 Si, 4.00 Cr, 1.50 V, 6.00 W, 6.00 Mo
Disston . . . 6N6
.80 C, 4.00 Cr, 2.00 V, 6.00 W, 5.00 Mo, .50 Cu
Firth-Sterling . . . Star-Mo M-2
.82 C, 4.20 Cr, 1.90 V, 6.50 W, 5.00 Mo
Great Western . . . 6-6-2
.80 C, .25 Mn, .30 Si, 4.00 Cr, 1.50 V, 5.75 W, 5.00 Mo
Houghton & Richards . . . No. 57
.80 C, .25 Mn, .25 Si, 4.00 Cr, 1.90 V, 6.00 W, 5.00 Mo
Hoyland . . . 6-6-2
.80 C, .25 Mn, .30 Si, 4.00 Cr, 1.50 V, 5.75 W, 5.00 Mo
Jessop . . . Mustang
.84 C, 4.20 Cr, 1.95 V, 6.35 W, 5.00 Mo
Latrobe . . . Electrite Double-Six M-2
.83 C, .25 Mn, .30 Si, 4.00 Cr, 2.00 V, 6.50 W, 5.00 Mo
McDonald . . . Radio
.84 C, .24 Mn, .26 Si, 4.00 Cr, 1.90 V, 6.50 W, 5.00 Mo
McInnis . . . Moly High Speed
.80 C, 4.00 Cr, 1.50 V, 5.50 W, 4.25 Mo
Milne . . . MM 6&6
.85 C, 4.15 Cr, 1.90 V, 6.40 W, 5.00 Mo
Peninsular . . . Penco 6-6
.83 C, 4.15 Cr, 1.90 V, 6.35 W, 5.00 Mo
Republic . . . Special M-O
.83 C, .30 Mn, 4.00 Cr, 1.90 V, 6.40 W, 5.00 Mo
Simonds . . . Molva-T
.80 C, 4.00 Cr, 1.60 V, 5.75 W, 4.50 Mo
Universal-Cyclops . . . Mo Tung 652
.82 C, .25 Mn, .30 Si, 4.00 Cr, 1.90 V, 6.50 W, 5.00 Mo
Vanadium-Alloys . . . Vasco M-2
.83 C, .25 Mn, .30 Si, 4.20 Cr, 1.90 V, 6.35 W, 5.00 Mo
Vulcan Crucible . . . TM-6
.83 C, 4.15 Cr, 1.90 V, 6.40 W, 5.00 Mo

M-3 . . . MOLYBDENUM-TUNGSTEN, 6-6-3

SAE Composition: 1.15 C, .30 Mn, .30 Si, 4.10 Cr, 3.25 V, 5.75 W, 5.25 Mo

JIC Composition: 1.10-1.30 C, .20-.40 Mn, .20-.40 Si, 3.75-4.25 Cr, 3.00 min V, 5.25-6.00 W, 4.25-5.75 Mo, .50 max residuals

Higher carbon and vanadium content combine for better wear resistance than M-2. Suitable for difficult cutting and shearing jobs. Requires special care in heating.

Houghton & Richards . . . No. 7
1.15 C, .25 Mn, .25 Si, 4.00 Cr, 3.00 V, 6.00 W, 6.00 Mo
Latrobe . . . Electrite HV-6
1.15 C, .25 Mn, .25 Si, 4.00 Cr, 3.00 V, 6.00 W, 6.00 Mo
Universal-Cyclops . . . Unicut
1.00 C, .25 Mn, .30 Si, 4.00 Cr, 2.40 V, 6.25 W, 6.25 Mo

M-4 . . . MOLYBDENUM-TUNGSTEN, 4-5-4

Higher carbon and vanadium content than M-3 for higher wear resistance. Annealing temperature 1600 C, hardening 2225 F, double temper 2 hr at 1000 to 1200 F.

Vanadium Alloys . . . Neatro
1.27 C, .25 Mn, .30 Si, 4.50 Cr, 4.00 V, 5.50 W, 4.50 Mo

M-6 . . . COBALT-MOLY-TUNGSTEN, 5-4-1-12

A steel with high red hardness, having properties similar to T-6. Suitable for cutting hard materials and heat-treated forgings. Operates at higher speeds and feeds than regular high-speed steels. Forging temperature 1800-1900 F, annealing 1550 to 1600 F, hardening 2150 to 2200 F, double temper 1050 to 1100 F.

Braeburn . . . Congo
.78 C, .25 Mn, .25 Si, 4.00 Cr, 1.40 V, 4.00 W, 5.00 Mo
12.00 Co

M-8 . . . MOLY-TUNGSTEN-COLUMBIUM, 4-5-1

A columbium-bearing high-speed steel with unusually high wear resistance. For general-purpose cutting. Resists decarburization in hardening. Forging temperature 1950 to 2050 F, annealing 1550 to 1575 F, hardening 2225 to 2325 F, temper 1000 to 1025 F.

Carpenter . . . Star Columbium
.80 C, 4.25 Cr, 1.50 V, 5.50 W, 4.50 Mo, 1.25 Columbium

M-10 . . . MOLYBDENUM, 8-0-2

A tungsten-free high speed steel offering marked economy for small tools. Requires care in heating to avoid decarburization. Forging temperature, 1900 to 2000 F, annealing 1550 to 1600 F, hardening 2150 to 2250 F, tempering 950 to 1050 F.

Allegheny Ludlum . . . VLM
.85 C, 4.00 Cr, 2.00 V, 8.00 Mo
Crucible . . . Rex VM
.85 C, 4.00 Cr, 1.90 V, 8.00 Mo
Houghton & Richards . . . Moly Van
.82 C, 4.00 Cr, 2.20 V, 9.00 Mo
Latrobe . . . Electrite TNW
.85 C, 4.00 Cr, 2.00 V, 8.00 Mn
Universal-Cyclops . . . Mo-Van
.85 C, .25 Mn, .30 Si, 4.00 Cr, 2.10 V, 8.00 Mo
Vanadium-Alloys . . . Van-Lom
.87 C, .20 Mn, .30 Si, 4.00 Cr, 1.95 V, 8.25 Mo

M-11 . . . COBALT-MOLY, 9-8-2-4

Special Steel for taps and cutters with good abrasion resistance and red hardness. Hardening temperature, 2100 to 2150 F, triple temper at 1025 to 1075 F.

Latrobe . . . Electrite Cromolon
.90 C, 8.00 Cr, 1.50 V, 1.50 W, 9.00 Mo, 4.00 Co

M-20 . . . COBALT-MOLY-BORON, 8-5-2

Low hardening temperature and toughness are combined in this economical high-speed steel. Suitable for taps, threading dies, form tools, and broaches. Forging temperature, 1750 to 1950 F, annealing 1550 to 1600 F, hardening 2025 to 2100 F, tempering 1000 to 1050 F.

Firth-Sterling . . . Mo-Chip
.59 C, .25 Mn, .25 Si, 5.00 Cr, 1.25 V, 8.00 Mo, 2.50 Co, .25 Boron

M-30 . . . COBALT-MOLY-TUNGSTEN, 8-2-1-5

High red hardness and wear resistance with loss of toughness. Recommended for turning chilled iron, locomotive tires, and heat-treated forgings and castings. Subject to decarburization. Forging temperature 1850 to 2000 F, annealing 1550 F, hardening 2225 to 2250 F, tempering 1050 to 1100 F.

Braeburn . . . Como
.77 C, .25 Mn, .25 Si, 4.00 Cr, 1.20 V, 1.55 W, 8.50 Mo, 5.00 Co
Firth-Sterling . . . Super Hi-Mo
.84 C, .25 Mn, .25 Si, 4.00 Cr, 1.25 V, 1.80 W, 8.50 Mo, 5.00 Co
Latrobe . . . Electrite Lacomo
.80 C, .30 Mn, .30 Si, 4.00 Cr, 1.20 V, 1.50 W, 8.50 Mo, 5.00 Co
Houghton & Richards . . . Super Molyhi
.82 C, .25 Mn, .32 Si, 4.00 Cr, 1.25 V, 1.50 W, 8.50 Mo, 5.00 Co
Universal-Cyclops . . . Super Mo-Tung
.82 C, .25 Mn, .30 Si, 4.00 Cr, 1.25 V, 1.50 W, 9.50 Mo, 5.00 Co

M-36 . . . COBALT-MOLY-TUNGSTEN, 6-6-2-8

SAE Composition: .85 C, .30 Mn, .30 Si, 4.10 Cr, 2.00 V, 6.00 W, 5.00 Mo, 8.00 Co
JIC Composition: .80-.90 C, .20-.40 Mn, .20-.40 Si, 3.75-4.25 Cr, 1.25-2.25 V, 5.25-6.00 W, 3.75-5.50 Mo, 7.50 min Co, .50 max residuals

Analysis of this steel is essentially the same as M-2 with the addition of 8% cobalt. This provides higher red hardness and considerably better wear resistance. Toughness is low, though better than the tungsten equivalent, T-5. Suitable for cutting gritty materials, heat-treated alloy steels, and stainless steels.

Allegheny Ludlum . . . Super DBL
.82 C, .40 Mn, .40 Si, 4.25 Cr, 1.65 V, 5.50 W, 4.25 Mo, 7.75 Co
Crucible . . . Rex M2-5
.83 C, 4.15 Cr, 1.90 V, 6.40 W, 5.00 Mo, 5.25 Co
Firth-Sterling . . . Super Star-Mo M-2
.84 C, .25 Mn, .25 Si, 4.10 Cr, 1.80 V, 5.50 W, 4.50 Mo, 9.00 Co
Houghton and Richards . . . Cobalt Moly
.88 C, .25 Mn, .25 Si, 4.10 Cr, 1.90 V, 6.00 W, 6.00 Mo, 9.00 Co
Latrobe . . . Electrite CO-6
.90 C, .25 Mn, .30 Si, 4.00 Cr, 2.00 V, 6.00 W, 5.00 Mo, 9.00 Co

M-40 . . . COBALT-MOLY-BORON, 8-4-1-8

More highly alloyed than M-20, this steel has wear resistance said to be several times that of other high-speed steels. Suitable for heat-treated steel, cast iron, brass, plastics, and other abrasive materials. Hardening temperature 2125 to 2175 F, double temper 2 hr at 1025 to 1050.

Firth-Sterling . . . Super Mo-Chip
.60 C, .25 Mn, .25 Si, 4.20 Cr, 1.80 V, 1.70 W, 8.20 Co, .50 Boron

M-50-56 . . . 4% Molybdenum, 1 to 4% Vanadium

Low alloy content of this group of steels suits them for applications not requiring full high-speed properties. Applications are body stock for carbide-tipped drills and reamers, wood cutters, pipe taps, thread chasers, and small drills.

M-50 Latrobe . . . Electrite MV-1
.80 C, .30 Mn, .25 Si, 4.00 Cr, 1.00 V, 4.30 Mo
M-52 Latrobe . . . Electrite MV-2
.88 C, .30 Mn, .25 Si, 4.00 Cr, 2.00 V, 4.30 Mo
M-54 Latrobe . . . Electrite MV-3
1.18 C, .30 Mn, .25 Si, 4.00 Cr, 3.00 V, 4.30 Mo
M-56 Latrobe . . . Electrite MV-4
1.40 C, .30 Mn, .25 Si, 4.00 Cr, 4.00 V, 4.30 Mo

Basic Suppliers of Steels in This List

Short versions of company names used throughout the list are indicated by bold-face type

Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa.
Amalgamated Steel Corp., Broadway and Wire Ave., Newburgh Mill Dist., Cleveland 5, Ohio
Anchor Drawn Steel Co., see Vanadium-Alloys
Atlantic Steel Corp., 1775 Broadway, New York 19, N. Y.
Atlas Steels Ltd., Welland, Ontario, Canada
Bethlehem Steel Co., Bethlehem, Pa.
Boyd-Wagner Co., 1440 W. Lake St., Chicago 7, Ill.
Braeburn Alloy Steel Corp., Braeburn, Pa.
The **Carpenter** Steel Co., Reading, Pa.
Colonial Steel Div., see Vanadium-Alloys
Columbia Tool Steel Co., Lincoln Highway and State St., Chicago Heights, Ill.
Craine-Schrage Steel Div., Detroit Steel Corp., 8701 Epworth Blvd., Detroit 4, Mich.
Crucible Steel Co. of America, 405 Lexington Ave., New York 17, N. Y.
Darwin & Milner Inc., 2345 St. Clair Ave., Cleveland 14, Ohio
Delaware Tool Steel Corp., Wilmington, Del.
Detroit Alloy Steel Co., Foot of Iron St., Detroit, Mich.
Diehl Steel Co., 236 Broadway, Cincinnati 2, Ohio
Henry **Disston** & Sons, Inc., Philadelphia 35, Pa.
Faitoute Iron Steel Co., Inc., 182-188 Frelinghuysen Ave., Newark 5, N. J.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Great Western Steel Co., Inc., 1011 East 61st St., Los Angeles 1, Calif.
Houghton & Richards Inc., 19 Jersey St., Boston 15, Mass.
Hoyland Steel Co., 405 Lexington Ave., New York 17, N. Y.
Heller Brothers Co., Newark 4, N. J.
Jessop Steel Co., Washington, Pa.
Kloster Steel Corp., 224-228 N. Justine St., Chicago 7, Ill.
Latrobe Electric Steel Co., Latrobe, Pa.
P. F. **McDonald** & Co., 17 King Terminal, Boston 27, Mass.
McInnes Steel Co., 441 E. Main St., Corry, Pa
A. **Milne** & Co., 741 Washington St., New York 14, N. Y.
The **Peninsular** Steel Co., 1030-40 McDougall Ave., Detroit 7, Mich.
Republic Steel Corp., 1970 Carter Rd, Cleveland, Ohio
Joseph T. **Ryerson** & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & Steel Co., Lockport, N. Y.
Tennessee Coal, Iron and Railroad Co., Birmingham 2, Ala.
The **Timken** Roller Bearing Co., Steel & Tube Div., Canton 6, Ohio
Uddeholm Co. of America Inc., 155 East 44th St., New York 17, N. Y.
Universal-Cyclops Steel Corp., Universal Div., Bridgeville, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

America's Road to Victory

. . . Let's Increase Production

This is the time to speak out—now—at the beginning.

Our industrial program for re-armament is getting off on the wrong foot.

The talking and writing about it emphasize the wrong things.

Its headline words are "cuts" and "controls."

Those words make bad propaganda for the cold war.

"Cuts" and "controls" are no words to challenge the imagination and energy of our own people. They won't impress the masters of the Kremlin. And they can only make it appear to the rest of the world that America thinks it can defend the free way of life by abandoning it.

America stands as the world's champion against aggression because America has become the most powerful free nation in the world.

How did we get that way?

Not by putting ceilings on wages; not by rationing or clamping iron-clad government controls all over business and industry.

To be sure, some temporary controls are necessary to channel very scarce materials speedily to use for defense. So, too, are special taxes and credit restrictions needed to combat inflation. But they will be fatal if they blind us to this fact:

We became the strongest nation in the world by out-producing every other nation.

Production—The Final Answer

Next year our government is planning at least a $40 billion military program. Instead of planning only on controls to divert $40 billion of production from the making of civilian goods to the making of military supplies, we should be figuring out also ways to push up total production.

Of course, our industrial plant is running at close to "capacity" now. And our labor force has reached almost full employment. There isn't much slack to be taken up.

Can even the United States add a $40 billion miracle of production on top of what it is already doing?

Our answer is "Yes"—and within two years. It can be done by adding about $6 billion each year to our program of capital investment which now runs about $22 billion a year.

Part of this added production will come from expanding our industries. The steel companies, for example, already have plans to increase their capacity almost ten per cent in the next two years.

But by far the largest part of that $40 billion of added production must come from higher productivity—raising industry's efficiency.

continued on next page

To meet our goals we need to raise our productivity five per cent a year.

Can it be done?

The answer is an emphatic "Yes."

Raise Industry's Productivity

McGraw-Hill's studies of industry's equipment show that there are countless opportunities for improving efficiency. Our manufacturing industries alone need at least $35 billion of new equipment to raise their facilities to first class technical standards.

Here are some of the broad possibilities reported by the trained editors of McGraw-Hill's business magazines:

In many manufacturing plants as much as 40 per cent of workers' time goes into moving materials and parts—shifting things about within the plant between processes and to and from shipping platforms.

FACTORY estimates that improved materials handling equipment and methods might well cut handling costs twenty-five per cent and save annually over 650,000 man-years of unnecessary labor.

Modern machine tools designed since World War II are 40 per cent more productive, on the average, than is old equipment. But AMERICAN MACHINIST surveys show that 95 per cent of industry's machine tools are of designs at least ten years old. Replacing them could raise productivity of the metalworking industries at least ten per cent—enough to absorb a major share of the metalworking industries' part of the defense program as now planned.

In coal mining, latest equipment and methods can raise productivity sharply. The editors of COAL AGE estimate that production of bituminous coal could be raised from seven tons per man-shift to ten within three to five years.

Many new textile production techniques are 50 per cent to 75 per cent more efficient than those in use now. If plants could be fully modernized, and full use made of latest management methods, TEXTILE WORLD estimates that output-per-manhour would rise 20 per cent. *A FOOD INDUSTRIES study indicates that modern equipment plus the best management techniques could raise productivity in food processing at least 20 per cent.*

These are just some of the opportunities that industry can seize and by which the nation can profit.

A Nation-Wide Effort

Of course, industry itself can't do the whole job. Labor, government and all the rest of us must cooperate.

Government's part is to see that its emergency controls are so applied that they will increase productivity and thus make possible an early lifting of such controls.

Labor's part is to help in the development of labor-saving methods and machinery and to welcome their adoption as the only sure way of continuing to advance the American standard of living while maintaining the American free way of life.

For all of us the job is to work constantly for an expanding, ever-stronger America with constantly growing productivity; not a pinched and shackled America cooped up under wage and price ceilings and tied to a ration card.

Challenge to Industry

Here is a sharp challenge to industry to study the best work-methods that are being reported—to use every minute and every dollar it can to replace obsolete equipment.

Here is a sharp challenge to government to do everything within its power to make its control policies and its fiscal policies strengthen the incentives to industrial modernization—to demand sacrifice for a purpose and not for effect.

The job to which such opportunities point will take time—though nothing holds back adoption of some of the simpler improvements in work-methods reported in business magazines all the time.

But increasing production is our one best hope that we may be spared the full array of price, wage and production controls now and be freed eventually from all controls.

General Omar Bradley has said that the protection of our national independence calls for "long-range commitments that we are willing to carry out."

A long-range commitment to fight this battle for peace with America's most powerful weapon—industrial productivity—is the surest guarantee of victory for the free world.

Let's make that commitment—now—at the beginning.

McGraw-Hill Publishing Co., Inc.

ROUND TABLE

Theirs Not to Reason Why

"You know that progressive die we just started to make, Al, the one for the support bracket? Well, Pierce came in yesterday with an idea for changing it. He showed me how he could make the die better—then went on to say that he thought the bracket was too light for the job anyhow."

"Not just one, but two, troubles to play with, eh, Ed? What do you do now? Gonna start on Jones, the tool engineer, or high Chief Engineer Thompson?"

"Haven't figured out yet. I'm sure Pierce is right on both counts. I don't figure on much trouble with Jones—he was a toolmaker himself once and can recognize a good die idea when he sees it. But Thompson is kinda hard to get to."

"Why not put it up to the Boss and let him fight it out on the high level? After all, it's his job to handle things with other departments."

"He's away the rest of this week, and the job is rush. As I see it, I've got to live or die with this one myself. I suppose a smart guy would tell Pierce to ask no questions—just go ahead. But I'm going to talk to Jones."

"Why don't you talk to Thompson, and save time?"

"And get my head taken off—and my throat cut later? What do you think I am—nuts?"

"If you're sure right, what can Thompson do? After all, you're both getting salaries from the same company."

"Yeah—but his is bigger. He's not gonna take criticism from a foreman—not when it shows his department has made a mistake. He'll tell me to keep my nose out of the design—all I got to do is to make a die that will produce it."

"But you've got him dead to rights! He ought to be big enough to listen—and to change if you can convince him."

"What, Al, and delay the job still more? They'll be asking questions, then, all the way up the line. Why didn't they design it right in the first place? Why did the job cost so much? Why didn't somebody catch it sooner? Is it worth it to fix one part, and have to fix all the other stuff that is affected by the change? No sirree, not for me!"

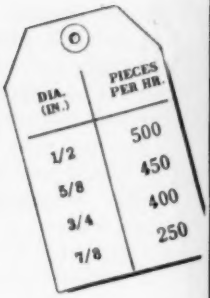
"Shucks, Ed, a man can only die once. If you're sure Pierce is right, and you still go ahead, you won't be able to live with yourself or with the men. They'll all think you're yellow."

"Not yellow, just cautious. If I get Jones to agree to change the die design, we'll get almost as much credit for being on our toes—and none of the grief that comes of fighting another department."

"Why not let Jones fight it out then? Tell him, and let him go after Thompson."

"Why should he? Nope, if it has to be done, I've got to do it myself. But I don't see why I should make a burnt offering of myself either."

HOW CAN A SITUATION like this be handled? Company responsibility is one thing, but personalities, particularly from other departments, are another. Is it worth while for Ed to take this chance? Your ideas and opinions will be appreciated. Discussions of earlier topics are on later pages.

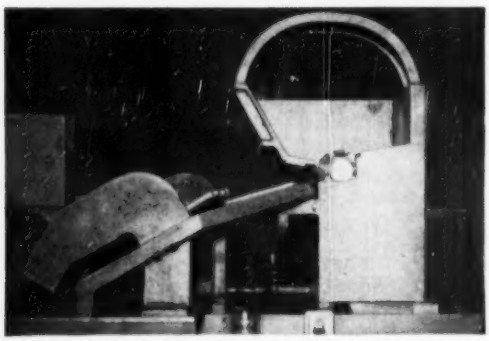


OLD METHOD Bolt blanks were heated in a slot-type oil-fired furnace. One man loaded furnace and passed blanks to operator of upsetting machine

INDUCTION HEAT + VERSATILE FIXTURE

A SPECIAL FIXTURE EASILY ADJUSTABLE FOR DIAMETER AND LENGTH MAKES IT POSSIBLE TO

CONSIDERABLE savings have resulted from the application of induction heating to upset heads on bolts at Northwest Bolt and Nut Co., Seattle, Wash. Blanks range from ⅜- to 1-in. dia and are 6 in. or more in length. The change has eliminated one upsetting machine and furnace and reduced the cost per bolt for all sizes handled.



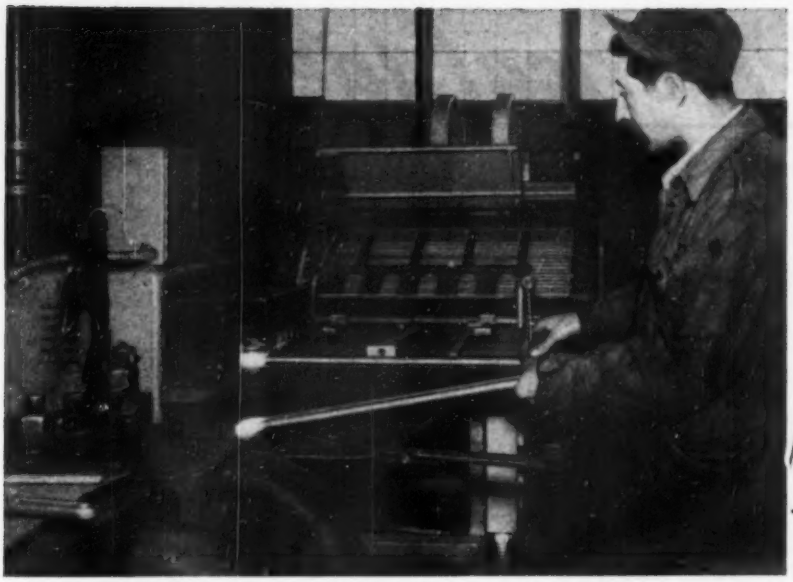
Hopper has shaft at bottom with pair of slotted steel disks. They are adjustable for blanks of different lengths and diameters

Blanks were formerly heated in a conventional oil-fired, slot-type furnace. A heater man would feed the furnace by hand, remove the blanks when they were at the desired temperature, and hand them to the upsetting-machine operator. Production varied with the length and diameter of the bolts, but averaged 400 pieces per hour.

For the new method, a Tocco 50-kw induction motor-generator with a remote-control portable unit was installed. The fixture was built by Mechanical Products Co., Seattle. It handles blanks from ⅜- to 1-in. dia and 4 to 30 in. long.

Blanks are loaded into a special hopper at the bottom of which is a shaft holding a pair of slotted steel disks. The disks slide on the shaft to suit blank length, and slots are adjustable to suit blank diameter. A small motor drives the shaft through a variable-speed drive and gear reducer. Reciprocal rotation of the disks delivers the blanks one at a time to the ramp of the magazine.

After blanks slide by gravity down the incline, they fall into position on the table in front of the



DIA. (IN.)	PIECES PER HR.
1/2	1500
5/8	1100
3/4	800
7/8	600

NEW METHOD Blanks are fed automatically through induction heating unit, are passed by helper to machine operator. Production is 2½ times the rate with old method

= DOUBLED PRODUCTION

BY W. R. YEAKEL, Partner
NORTHWEST BOLT AND NUT CO.

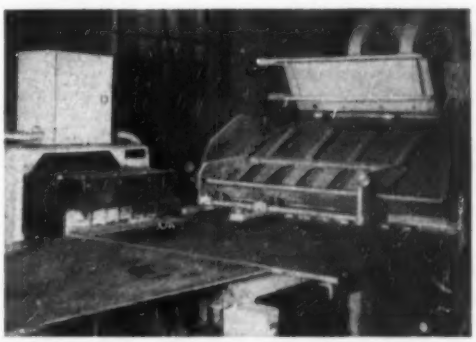
APPLY INDUCTION HEATING TO HEADING OF LARGE BOLTS, CUTTING EQUIPMENT IN HALF

feed bar. This bar has a series of fingers spaced 1 in. apart and is driven by an air-operated piston. The fingers advance to push the blanks along the table and through the slot-type induction coil, then retract to permit another blank to drop off the incline in front of the fingers.

Piston operation is controlled by an electric timing mechanism which can be adjusted in split seconds. For example, ¾-in. blanks are fed at a rate of one every 3¾ sec, and ⅝-in. blanks are fed one every 3¼ sec. The production rate now averages 1000 pieces per hour, an increase of 600 pieces per hour. Production rates for various diameters are shown in the tables above.

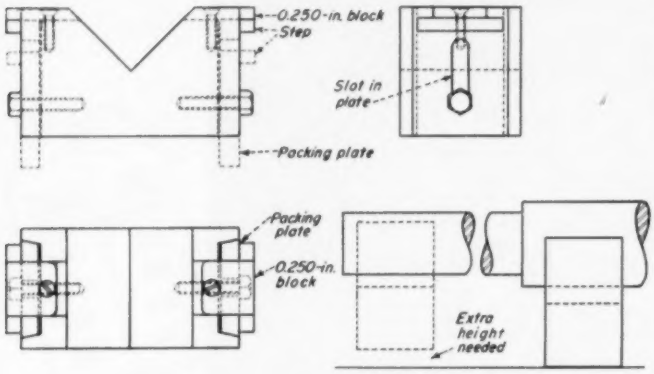
The low maintenance cost compared with the cost of rebuilding brick-lined furnaces plus the fact that no heating-up time is required more than offset the additional cost of electricity over preheated fuel oil. Cost of water to cool the motor-generator set and the induction coil is negligible.

The increase in production and longer die life resulting from the reduction in scale have made possible a lower cost per bolt. Uniform heating of each blank has meant better quality and fewer rejects. One heading machine, one oil-fired furnace, and the labor of two men have been eliminated by the increase in production of the new setup. The heading team is enthusiastic about the installation because of the absence of heat and noise.



Feed fingers spaced along bar at foot of ramp from hopper push blanks through heating unit. Drive is by a pneumatic piston

Practical Ideas



Height Adjustment Added To Standard V-Block

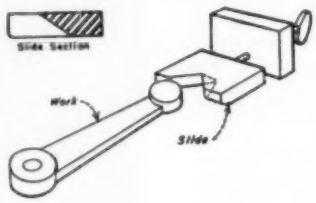
FOR SHAFT-SETUP JOBS where the shaft may have a number of different, stepped diameters, it is necessary to use two V-blocks with one of them shimmed up to hold the shaft's axis horizontal. This kind of setup can be expensive and slow. As a solution to the problem, an ordinary block can be made adjustable.

The block is first milled on opposite sides of the notch to form vertical slots with tapered edges. To fit these, packing plates are made to the thickness of the grooves and to the same tapered-edge form. At the top of each plate a projecting step is left, and this is machined square and exactly 0.250 in. thick.

Across the top of the block, right through the notch, a second pair of notches or grooves are cut. This pass is made 0.250 in. deep so two short blocks 0.250 in. thick can be screwed down into the block to match the projections on the plates. After the plates are slotted and capscrews are assembled into the V-block to hold them, the top and bottom surfaces of the assembly are machined off to make the plates and small blocks even with the V-blocks' surfaces.

When the plates are tight up against the small blocks, a micrometer measurement from the lower sides of the projections in the plates to the tops of the small blocks should read exactly 0.500 in. By releasing the capscrews, shifting the plates the required distance, and retightening the screws, the block can be raised for a shaft setup.

Calculating the amount of added height necessary is simple. Subtract the smaller diameter from the larger one, divide the remainder by 1.414, and you have the necessary dimension—assuming that the V-notch is a conventional 90° cut. *W. M. Halliday, Southport, England.*

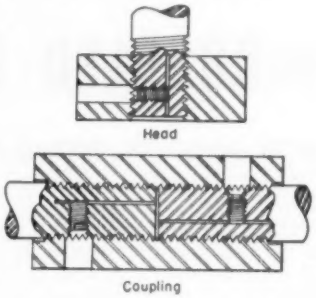


Drill Jig Grips Casting In Slanted V-groove

THIS COMBINATION centralizing and clamping slide for a drill jig located cast connecting rods so the boss at the small end could be drilled. The hole at the larger end was cast, and though locations could be made from it, the clamp had to be flexible to allow for minor variations in the casting.

A pivot pin, located in the middle of a locating surface for the large boss, located that end of the casting. At the other end, over a flat locating surface, a slide with a V-groove slanted back and down gripped the end of the work. To keep the slide from riding up, the overhanging part of the jig that carried the drill bushing was made low enough to keep the slide level.

Castings were slipped onto the pivot pin, then dropped flat; and the slide was clamped by turning a wingscrew. The V in the slide acted both as a centralizer and as a clamp. *H. J. Malm, Erie, Pa.*

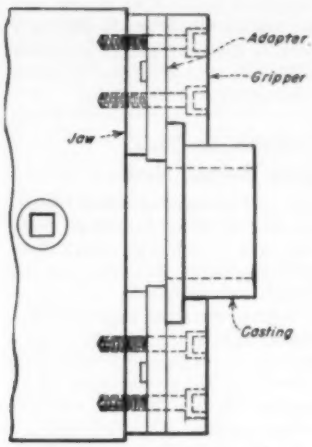


T-Heads Assemble To Slotted Studs

MANY MILLING, shaping, planing, and boring setups can be made easier if T-bolts and regular bolts, are replaced with bolts that have tight-fitting but removable heads.

The design illustrated is used mainly for assembling T-heads to standard bolts or studs. An off-center slot down the threaded end of the stud is spread after the head is assembled by tightening a socket-head screw that assembles in a small cross hole.

Two long studs can be coupled together with a similar nut that has clearance holes for tightening the setscrews in the studs. *A. R. Rasrl, Rio de Janeiro, Brazil.*

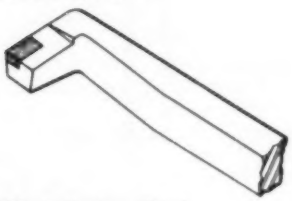


Jaw Attachments Chuck Flanged Castings

SEVERAL HUNDRED flanged iron castings had to be bored, but when chucked in the usual way, the castings would spring the chuck jaws. To overcome this trouble I made soft-steel jaws to fit the combination chuck.

Four pieces were shaped to fit the jaws, then four more were added to overlap and grip the parts to prevent twisting. After assembly, the temporary jaws were bored to the OD of the casting, allowing a grip all around the flange at each jaw.

This permitted facing off the open end and boring the ID. The other end of each part was faced in a second operation. *Daniel Love, Worcester, Mass.*



Offset Boring Tool Has Carbide Tip

SUCCESSFUL BORING of long holes on a lathe was accomplished with this carbide-tipped tool, equipped with a long, braced shank.

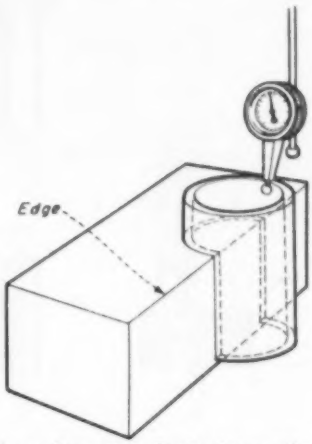
A piece of cold-rolled steel was cut to form the tool. About ½ in. at the end was bent over cold to form the offset tip, after which the carbide was silver-soldered on. A notch was cut away to take the 3/32x1/8x3/16-in. tip.

Iron castings cored as small as ¾ in. were bored out with little or no trouble with the tool. *Edward Diskavich, Torrington, Conn*

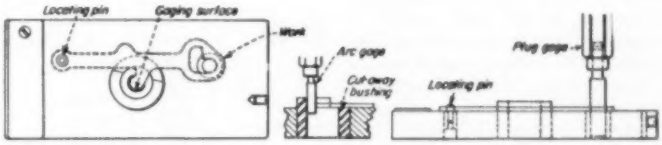
Cut Drill Bushing Locates Stock Edges

A HANDY, easily made little device for locating an edge on a workpiece in the jig borer or milling machine can be adapted from a drill bushing. One with a ¾-in. ID and a 1¾-in. length will do for most purposes.

The flanged part of the bushing is cut away with a rubber-bonded parting wheel, and a soft-steel plug is pressed into the bore of the bushing. Then the bushing is clamped in a V-block and a flat about an inch long is milled down to the center. The plug simplifies measuring the bushing to see that the cut is exactly to the center. It also braces the bushing to prevent distortion.



After the plug is removed, the bushing can be set on the edge of a piece of work, and the table shifted so a dial indicator on the machine spindle will line up the spindle on the edge. *Stanley G. Hagen, Richmond, Calif.*



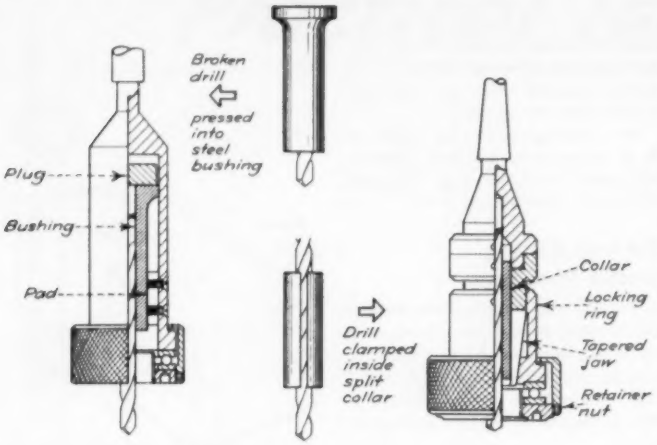
Unusual Part is Checked By Unusual Gage

THIS GAGE PLATE carries three bushings that locate plug gages and a pin to check dimensions and shape of a workpiece. The unusual part of the setup is the middle bushing and the method of gaging.

The plate has a locating pin pressed permanently into a small bushing at the left end. At the right end is a larger bushing into which a go, no-go plug is inserted to check the length of the part and the shape of the end of the rounded, L-shaped slot.

The center bushing is cut away above the surface of the plate on the back side, allowing the part to project over it. When the part is located and after the right-hand end has been checked, the plug gage for the end is left in position to fix the part, and a plug gage is inserted in the bushing between its wall and the edge of the part. Swinging the go and no-go ends of the gage around the arc of space between the bushing and part indicates whether the part is acceptable or not.

This is a case of checking an OD with an ID gage, but it works quite well; and is really a simple solution to a tough gaging problem. *F. A. Adams, Dayton, O.*

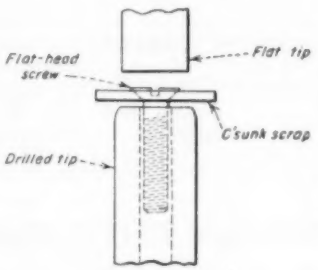


Countersinking Adapters Cut Rivet Holes

TWO COUNTERSINKING TOOLS are illustrated. Both are used in our shop for countersinking holes in sheet-metal assemblies so flush rivets can be assembled.

The left-hand adapter is fitted with a depth stop to control the downfeed of the drill, which is chucked inside a tight-fitting long bushing. To make it easy to center the hole under the drill, the bushing and drill are centered inside the adapter housing by means of a flange on the bushing and several locating blocks screwed to the wall of the adapter. Thus, the drill and bushing can drop down and the work can be located easily because of good visibility under the adapter. As the spindle is brought down, friction between the adapter, spacing block, and end of the bushing makes the drill turn when it contacts the work. To prevent damage to the work, a ball bearing supports the depth stop so it will not rotate with the adapter.

The right-hand adapter is designed especially for using up old drills with broken shanks and short drills. A depth stop is similar to the one on the other adapter. The adapter will chuck drills that have become worn or ground undersize because tapered locking jaws are tightened by means of a tapered-and-threaded locking ring. These jaws grip the old drill firmly inside a long split bushing. *Paul Van der Steen, Aalst, Belgium.*



Knurled-Head Screws Made by Welding

THUMBSCREWS are often used around our shop, but it is always necessary to turn them up as needed. A simple way to produce a screw of this sort—if a spotwelder is available—is to make it from a flat-head screw and a washer or piece of scrap stock.

First, an old welding tip is drilled out to clear the screw, and this is installed on the machine with a flat tip at the other pole. Then a washer or piece of scrap turned to washer shape is loaded on the drilled tip, and the screw is dropped in place. After the two are welded, the screw can be held in a collet so the knurl can be produced on the edge of the washer. *Bernard Levowich, Brookline, Mass.*

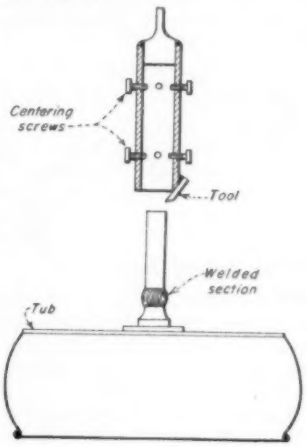
Oversize Box Tool Turns Welded Shaft

THE JOBBING SHOP in which I work has the reputation for always finding a way to do things, even if they seem impossible. However, this one almost had us stumped.

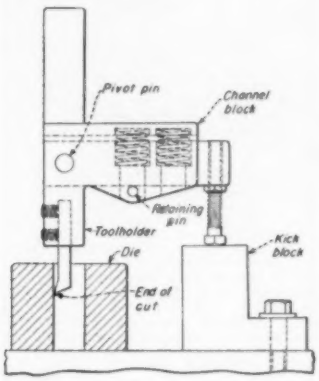
A huge extractor basket from a comercial laundry had been damaged on its shaft, and it had to be welded up and turned back to its original shape. The job was too large, even for our boring mill.

Finally we got the idea of placing the basket on the base of one of our radial drilling machines with the shaft sticking up. The tool was made was something like a box tool, although it was based on a long piece of large-diameter pipe Brass setscrews in tapped holes in the pipe wall were adjusted to center the tool on the shaft. These setscrews bore on the unworn section of the shaft, so the tool ran true enough. A toolbit, after being ground, was brazed to the end of the pipe to turn the shaft.

After the roughing cut over the welded section, the brass setscrews were readjusted to shift the toolbit closer to the work, which allowed a closer finishing cut. *R. G. Simmons, Monroe, La.*



Small drills can be chucked accurately, even after the jaws have become worn and smooth, by wrapping small-diameter soft copper wire around the shanks in a single layer. The chuck jaws will grip the copper firmly, and the drills will be held concentric. *Federico Strasser, Santiago de Chile.*



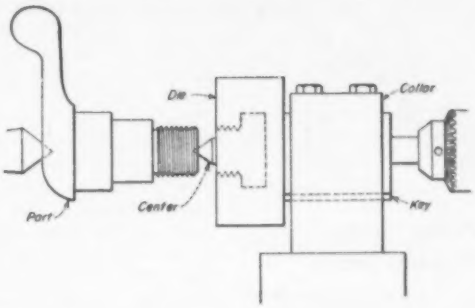
Slotter Kicker Stops Cut At Predetermined Length

FOR A PLASTIC shower-spray part we were producing, we had to cut a mold with serrations in the side which stopped at a set dimension. To do the job on the slotter, I made a kicker that moved the tool away from the work at exactly the right place.

The toolholder shank has a channel milled in it, and the toolholder proper rests in this channel, pinned in place and restrained by two springs. As the tool comes down, an adjustable stop hits a kick block on the slotter table. When this happens, the holder pivots away from the work.

To prevent damage, the length of slotter stroke had to be adjusted carefully so the ram would not force the holder down too far, but the kicking mechanism allowed some leeway on this point.

Not only did the mechanism stop the cut in the right place; it also provided a good finish to the end of the cut, made as the tool came away from the work. *E. M. Hallberg, Rockford, Ill.*

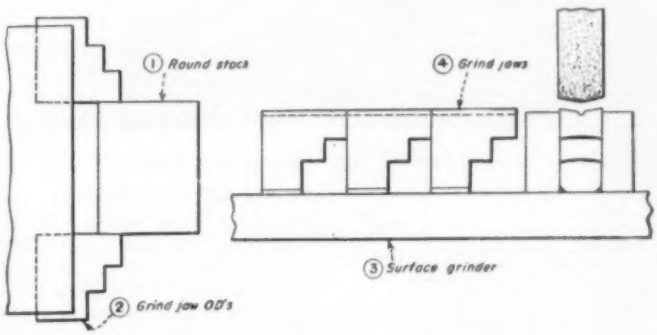


Center Setup Guides Threading Die

THIS SETUP for short-run production jobs on threading work is for cases where the work cannot be easily chucked and where a solid threading die must be used.

A long, thin center is utilized to hold the part from the tailstock, and a conventional center holds it from the headstock. The die is supported in a collar built up from the cross-slide; located so the die can be advanced but will be well supported to the end of its travel, guided by the split collar.

The part is centered, then the die is advanced by hand. It is held in alignment by a key on the die shank and keyway in the collar. After the lathe is stopped and the die retracted, the center can be backed off to release the part. *George Duff, Haverhill, Mass.*



Quick Method Trues Universal-Chuck Jaws

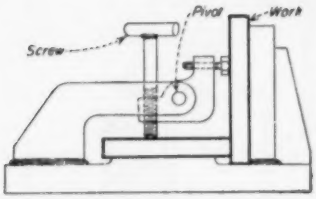
HERE IS a way to true up the jaws of a 3-jaw universal chuck:

1. Get a commercially round piece of stock about 2 in. long and thick enough to extend the jaws about ⅛ in. beyond the chuck body when gripped.

2. Turn or grind the protruding edges of the jaws.

3. Remove jaws from chuck, place ground edges on surface-grinder table, block them up so they are steady, then dress grinding wheel to jaw shape desired.

4. Grind jaws and replace them in chuck. The result is a set of jaws that will run as true as possible. *J. E. Gandy, New Brighton, Pa.*

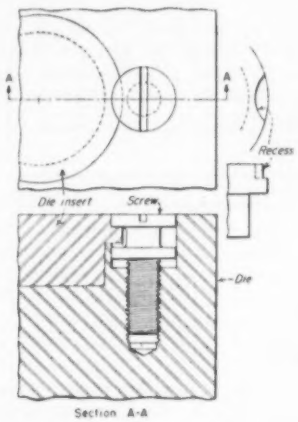


Double-Action Clamp Speeds Welding Setups

A SIMPLE, two-directional welding-fixture clamp, like that illustrated, can eliminate 50% of clamping and releasing time when a production-welding job is working. The clamp works with a pivoting member that grips two flat plates of the weldment when one screw is operated.

The fixture is welded up to position both workpieces in correct alignment, then a yoke is added to overhang the lower plate. Pinned to the yoke is a pivoting bracket that is drilled and tapped in two directions.

The small capscrew is adjusted to the right position so tightening on the main handle will force both screw points against the work. *H. G. Frommer, Milwaukee, Wis.*

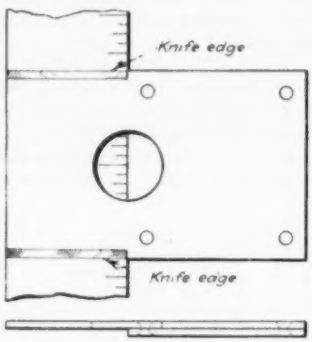


Die-Insert Screw Has Three Functions

SEVERAL INSERTS in the same die cavity often make possible the production of a number of parts in rotation, without changing the die itself. In such a setup, or for any similar fixture where interchangeable components are used, a set of special screws makes fastening the inserts easy.

The screw has three functions. First, it holds the die insert in the die. Second, it prevents the insert from turning or shifting (if the insert is round, as this one was). Third, it pulls the insert out of the die when it is turned out of the hole in the die proper. This is the reason for the second, lower, flange.

To make sure the screw holds the insert in place, a recess that is the same size as the radius of the screw's flange is ground in the top outside edge of the insert, as shown in the illustration. *Cliff Bossman, Dayton, Ohio.*



Layout Aid Helps Square Off Die Work

TO HAVE a layout tool that would be accurate, permanent, and take a beating, I made this gadget from two steel plates. The bottom plate is exactly square, machined accurately, and deburred carefully. The top plate is rectangular with a hole cut about in its middle. The two are riveted together carefully so their edges match. The tool can be laid over a common steel rule, butted against it, and checked for contact by observing the edge of the bottom plate through the hole in the top one. Lines perpendicular to the steel rule can be scribed with precision by guiding the scriber point along either knife edge of the tool. *Alwyn Ward, Sheffield, England.*

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JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

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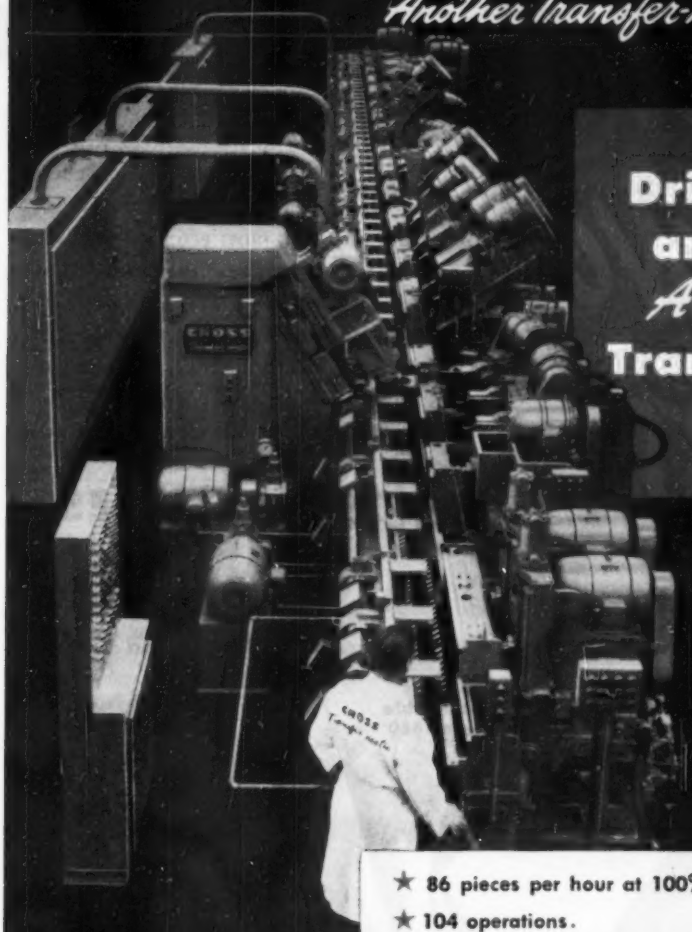

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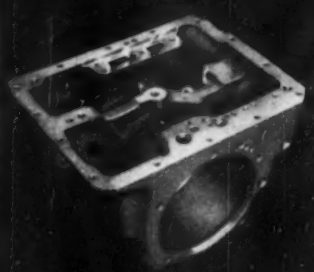

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Inspection Form for Precision Gears—I

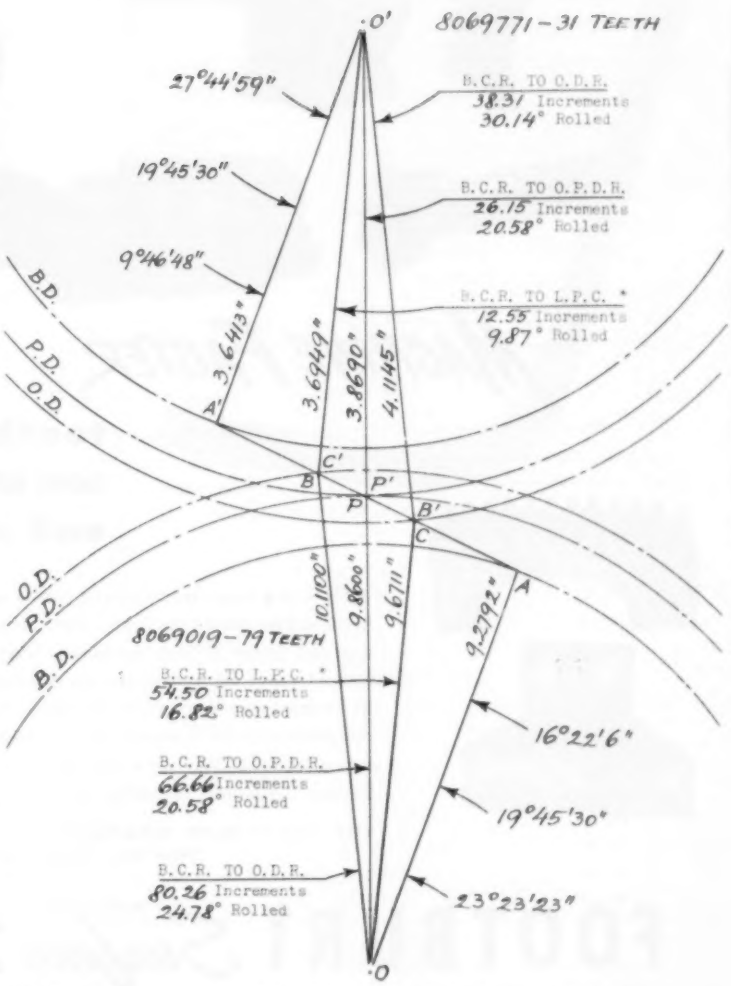
BY JAMES W. DUFFY, Gear Specialist, Allison Div., General Motors Corp.

IN THE production and inspection of precision gears, it is essential to know certain data: the length of the line of contact, the number of degrees rolled from the base circle to the lowest point of contact, increment readings for the involute checker, and the theoretical contact ratio.

The basic data for a pair of gears is entered on a layout (this page) and on a gear analysis form (page 175) by the gear engineer. These data are: dimensions $A'O'$, $P'O'$, and $B'O'$, also AO, CO, and BO. He also fills in the top two lines of the gear analysis form. Necessary computations for the remainder of the form can be made by a calculating department.

The completed forms are used by the inspection department and the gear laboratory to check whether the production department is producing the involute curve desired by the gear engineer. Also, these forms provide a permanent record in a coherent pattern that anyone can follow. And they serve as instructional matter to men in the shop.

Forms were worked out for use with the Illinois profile measuring machine. However, all involute checkers are made to show each degree of involute rolled from the base circle to the outside diameter of the gear. But in addition to obtaining the low-



* L.P.C. = Lowest Point of Contact O.P.D.R. = Operating P.D. Radius

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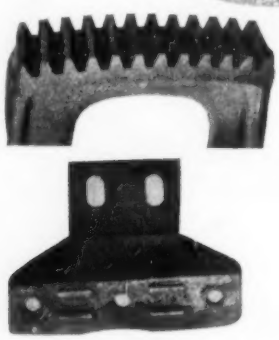

• Slots, serrations, teeth, flat and curved sections are all being surface broached on many jobs faster, more accurately and at less cost than they had formerly been machined. Surface broaching is applicable to steel, cast iron, bronze, copper or aluminum parts. Machines may be tooled up for one specific operation but in many cases more than one part can be surface broached on one machine by using additional sets of tooling. May we work with you in finding where Footburt Surface Broaching Machines can save you money in your plant?

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Inspection Form for Precision Gears—II

est point of contact, pitch diameter, and the degrees rolled to the outside diameter of the gear, the forms include the tangent-bar or increment settings for the Illinois equipment.

Note that the base circle $= BCR = OA$ and $O'A'$.

The lowest theoretical point of contact $= LPC = OC$ and $O'C'$. This cannot always be obtained. Much depends on the design of the hob; that is, the amount of protuberance, the natural undercutting of the involute profile caused by the hob as it travels in its trochoidal path. To some extent the path of the hob can be controlled by using one with a short lead.

Operating pitch-diameter radius $= OPDR = OP$ and $O'P'$. The outside diameter radius $= ODR = OB$ and $O'B'$.

Some engineers design design gears to be hobbed by standard tools, but do not have the gear sets operate on theoretical centers. Whenever the operating centers are changed, the operating pressure angles are automatically changed. A decrease in the operating centers decreases the pressure angle.

A short-lead hob increases the active profile, thus lengthening the line of action BC and increases the ratio of contact. In the computations the diametral pitch was taken as 4.006085 and the operating pressure angle as 19° 45′ 30″. The gears were actually hobbed with a standard 4 DP hob of 20° pressure angle.

GEAR ANALYSIS

Part No. 8069771 No. Teeth 31 Part No. 8069019 No. Teeth 79

Normal D.P. 4.006085 Normal P.A. 19°45'30" Base Pitch 0.73803"

COS. ∠ AOB = OA/OB	= 9.2792 ÷ 10.1100	= 0.917823	= 23°23'23"
AB = OB Sin. AOB	= 10.1100 X 0.396983	= 4.013498	
AP = OP Sin. AOP	= 9.8600 X 0.338055	= 3.333222	
BP = AB - AP	= 4.013498 - 3.333222	= 0.680276	
COS. ∠ A'O'B' = O'A' / O'B'	= 3.6413 ÷ 4.1145	= 0.884992	= 27°44'59"
A'B' = O'B' Sin. A'O'B'	= 4.1145 X 0.465605	= 1.915731	
A'P' = O'P' Sin. A'O'P'	= 3.8690 X 0.338055	= 1.307934	
B'P' = A'B' - A'P'	= 1.915731 - 1.307934	= 0.607797	
Length of Contact			
= BB' = BP + B'P'	= 0.680276 + 0.607797	= 1.288073	
AC = AB + BB'	= 4.013498 + 1.288073	= 2.725425	
A'C' = A'B' + BB'	= 1.915731 + 1.288073	= 0.627658	
TAN. ∠ AOC = AC / OA	= 2.725425 ÷ 9.2792	= 0.293713	= 16°22'6"
TAN. ∠ A'O'C' = A'C' / O'A'	= 0.627658 ÷ 3.6413	= 0.172319	= 9°46'48"
Lowest Point of Contact			
L.P.C. at OC = OA/COS. ∠ AOC	= 9.2792 ÷ 0.959472	= 9.671152	
L.P.C. at O'C' = O'A'/COS ∠ A'O'C'	= 3.6413 ÷ 0.985470	= 3.694988	

DEGREES OF INVOLUTE ROLLED FROM BASE CIRCLE TO:

OC = Tang. AOC x 57.29577	= 0.293713	X 57.29577	= 16.82°
OP = Tang. AOP x 57.29577	= 0.359205	X 57.29577	= 20.58°
OB = Tang. AOB x 57.29577	= 0.432524	X 57.29577	= 24.78°
O'C' = Tang. A'O'C' x 57.29577	= 0.172372	X 57.29577	= 9.87°
O'P' = Tang. A'O'P' x 57.29577	= 0.359205	X 57.29577	= 20.58°
O'B' = Tang. A'O'B' x 57.29577	= 0.526046	X 57.29577	= 30.14°

ILLINOIS TOOL WORKS INVOLUTE MACHINE INCREMENT READINGS, FROM BASE CIRCLE TO:

OC = AC x 20	= 2.725425	X 20	= 54.50
OP = AP x 20	= 3.333222	X 20	= 66.66
OB = AB x 20	= 4.013498	X 20	= 80.26
O'C' = A'C' x 20	= 0.627658	X 20	= 12.55
O'P' = A'P' x 20	= 1.307934	X 20	= 26.15
O'B' = A'B' x 20	= 1.915731	X 20	= 38.31

THEORETICAL CONTACT RATIO

= BB'/ Base Pitch	= 1.288073 ÷ 0.73803	= 1.7452

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Using a conventional wheel on his Landis Cylindrical Grinder to remove .015″ to .020″ stock from SAE 1040 steel, and held to a tolerance of plus .001″ minus .000″, he was able to finish only 10 pieces per wheel dressing. Wheels were being worn out excessively fast by too many dressing and truing operations; and production was slowed by the resulting work stoppages.

A Robertson Engineer, called in for advice, recommended substituting an 18″ x 2″ x 5″ RA 462-MV Robertson Wheel. With no other change in grinding method, *production immediately jumped to 30 shafts per wheel dressing* . . . a threefold increase in production, and longer wheel-life to boot!

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Calculation of Small Punches

BY FEDERICO STRASSER

PRESS-TOOL members are seldom calculated. Their dimensions are determined almost always by practical experience. If punches are of "average" size, their cross-section is amply sufficient to withstand stresses imposed in service. However, with small punches, it is well to check their strength.

First, check whether the compressive stress on the punch exceeds the compressive strength of the punch material by the formula $K_c = P/A$. Here K_c = compressive strength of the punch material in lb/sq in.; P = blanking or piercing pressure, psi, and A = cross-sectional area of the punch.

The cutting pressure is calculated by the formula $P = K_s pt$, where: K_s = ultimate shearing strength of the stock, psi, p = perimeter of cut, in.; and t = stock thickness, in.

Since $A = \pi d^2/4$ and $p = \pi d$, the formula for K_c can be rewritten to: $K_c = 4K_s t/d$. And if the punch is made from hardened tool steel with a compressive strength of 200,000 psi and the shearing strength of mild steel is 55,000 psi, these values can be substituted in the above formula, giving a ratio for $d/t \geq 1.1$. In other words, the punch diameter must be at least 10% greater than the stock thickness.

The punch height must be chosen so that when the die is completely closed, the punch plate will not strike a stationary part of the tool, and need for regrinding allowance must be taken into account. The height of small punches should be checked, however, with the well-known Euler formula $P = \pi^2 EI/L^2$, where E = modulus of elasticity (30,000,000 to 34,000,000), I = moment of inertia ($I = \pi d^4/64$ for round punches) and L = punch height, in.

Since $P = K_s pt$, or $K_s \pi dt$, we can set this value of P in the Euler formula and simplify (assuming E = 32,000,000 and K_s = 55,000) and obtain the formula $L \leq \sqrt{90d^3/t}$.

If a check of the punch height shows that the punch diameter is too small, one or more of the following remedies may be tried:

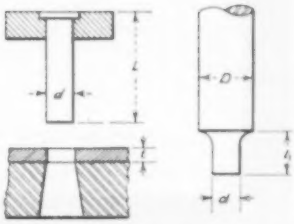
1. Select punch steel of higher compressive strength.

2. Shorten the punch length if tool design will permit.

3. Make a punch with a thick body and a short cutting point of correct diameter.

4. Decrease the cutting pressure by: (a) increasing the punch and die clearance, or (b) use special points or shear on the punch face.

Examples: Assume 0.5-in. holes are to be pierced in mild steel of 0.2-in. thickness, the punch being 1.75 in. long. Will the punch withstand the cutting pressure involved? In this case the ratio $d/t = 0.5/0.2 = 2.5$, which is in excess of the minimum value of 1.1. So the punch



diameter is all right. What about the height? Here $L \leq \sqrt{90 \times 0.5^3 / 0.2}$
$= \sqrt{90 \times 0.125 / 0.2}$
$= \sqrt{56.25} = 7.27$,
and hence the length chosen is well within the permissible maximum length.

Take another case: hole diameter = 0.055 in.; stock thickness t = 0.04, and punch height L = 2 in.

Here the punch diameter is not too small because 0.055/0.04 = 1.375.

But $L \leq \sqrt{90 \times 0.055^3 / 0.04} = \sqrt{0.3743} = 0.61$. Thus, in this example, a straight punch cannot be used. Instead, use a shoulder punch as illustrated with the small diameter having a length less than 0.61 in.

What should the large diameter be? Since $L \leq \sqrt{90\ d^3/t}$, and we will use D for d, the formula for $D \geq \sqrt[3]{L^2 t/90}$. In this case, L = 2 and t = 0.04. Hence $D = \sqrt[3]{4 \times 0.04/90} = 0.122$ in. In other words, the large diameter of the shouldered punch should be ⅛ in.

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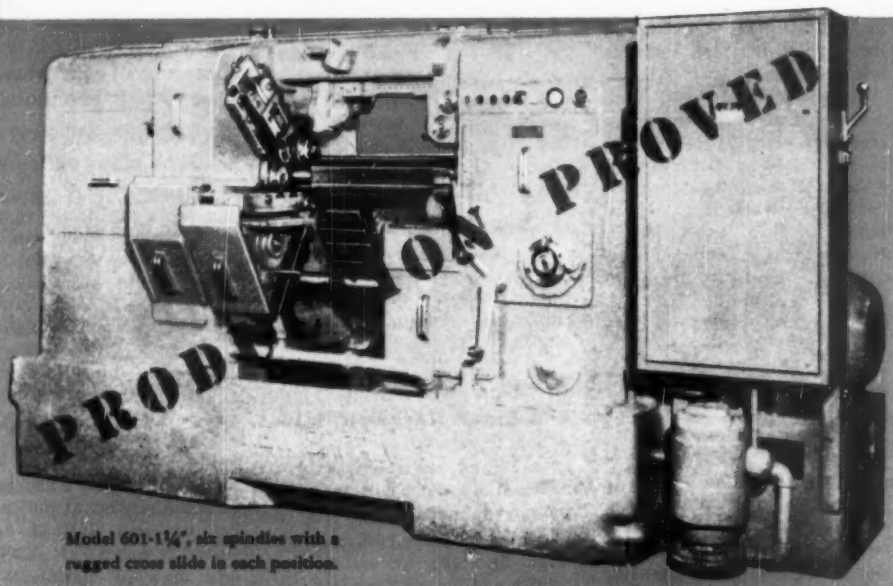

Model 601-1¼", six spindles with a rugged cross slide in each position.

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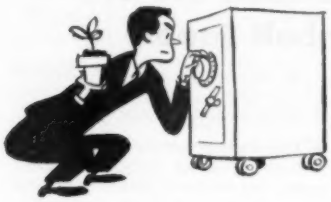


Dirt-Cheap Steel

LATEST IDEA of Ben Fairless, president of U.S. Steel, is that steel is literally cheaper than dirt. Average price of all steel sold by U.S. Steel this year is just under a nickel a pound, and some products sell at 3½ cents a pound. Says he: "What else in the world can you buy today for 3½ cents a pound? Eggs, butter and meat? No! They cost from 20 to 30 times as much as steel. There is literally nothing in our grocery store at home that you can buy for as little as 3½ cents a pound. . . . Steel is cheaper than cloth . . . lumber . . . newspaper stock. If you live among the cliff dwellers of New York City, and want a little potting soil to put around a geranium, you can buy it at your neighboring seed store for 7 cents a pound . . . Yes . . . steel is literally cheaper than dirt!"

Broach-cycle seat

AT IBM, Endicott, N.Y., vertical-broach operators have special seats. A short section of pipe is brazed vertically into the guard rail at the back of the operator's platform. On it is a swivel arm carrying a conventional bicycle seat. Thus the seat can be swung out of the way when not in use, yet is readily available during small-part production, regardless of platform height above the floor.

Strong Iron

REMEMBER how country people once said well water of rusty color was healthy because there was iron in it? Turns out that ancient knight preferred to drink water in which a sword had rusted; he thought he might thus absorb strength from the iron. He and his horse wore as much as 200 lb of iron and steel—probably much more "strength-giving." Even better, in World War II, we produced 24,600 lb of steel per soldier.

Loading vs Fluid

GRINDING TESTS reported by three Socony men at the ASME Fall Meeting in Worcester indicate that heavy-duty soluble oil promotes least metallic-loading of wheels, conventional soluble oils show slightly more, non-petroleum soluble oils more again, and tap water most of all. Loading increased with grinding-fluid dilution, as did particle size. There were some indications also that power consumption and wheel wear increased as wheel loading increased.

CU at B-21

LARGE PLANTS pose special problems. At the new 20-acre GE turbine plant in Schenectady, the nine machinery bays are lettered A, B, C, and so on, while sections the other way are numbered 1 to 26. Thus a tool crib, particular machine, emergency, or executive rendezvous can readily be located by "A-25" or "D-12", which avoids complicated identification by department or general area.

As plugs, the plant has its own souvenir postcards for visitors (who can look out over the machinery bays from a gallery at one end, accessible from the fourth floor of the fronting office building) and its own lump sugar with plant picture on the wrapper.

Verbally Speaking

WHEN A NEW MACHINE or process is introduced, the inventor's or trademarked name tends to become a generic or general term, then may even become a verb. Witness the Keller machine, and the process now commonly called "kellering," even when done with competitive machines. It's an old American habit—pushing the language around to suit the circumstances. Other examples are "brinelling," dieselizing," and such—even "boozing" (not strictly a Metalworking process) from Col. Booze, one of the early whisky makers.

Incidentally, if a trademarked name (noun) is permitted to be used generically or as a verb by the owner, he loses his right to it. Thus, Eastman Kodak stopped use of the phrase "Kodak as you go," and it's still Dry Ice, Frigidaire, and Superfinish.

Look! No Tools

BECAUSE quietness and smoothness are essential to the operation of the Gray Audograph, no tools capable of changing the size or shape of metal are permitted on the assembly line. Only exception is pliers for forming loops in wire. If parts won't fit exactly as required, they are rejected by the assemblers and a check is made immediately to find the cause of the trouble.

According to Vernon Haag, v.p. of production, one stroke of a file or one twist of a reamer can produce the equivalent of five years' wear on the operating mechanism. So parts must fit—or else.

Cold Extrusion Points

TWO FACTORS are essential to success in cold extrusion, according to W. W. Galbreath, consultant, Heintz Mfg. Co. First, press size must be adequate; the punch must not hesitate after it has started to compress the slug. Second, lubrication of the part is of prime importance. The Germans Bonderized their slugs, then coated them with heavy vegetable oil or tallow. Mineral oil, according to Mr. Galbreath, should not be used for cold extrusion.

Colt Has Foal

COLT HAS SUCCUMBED to aluminum alloys for the receiver and main-spring housing of the .45 automatic. The result is a 26½-oz weapon, intended primarily for military use, although models are chambered for .45, .38, and 9-mm cartridges to satisfy the sporting demand.

News of Metalworking——

McGraw-Hill

WORLD NEWS

PILOTLESS PLANE—A radio-controlled pilotless jet aircraft is being developed in Australia, at request of the British government. It will be used as a flying target for all types of anti-aircraft projectiles, including guided missiles.

JAPANESE TRAMS—The Japanese Teikoku Rolling Stock Co. will shortly conclude a contract to supply 150 electric tram-cars to Brazil. American and British firms also competed for the order.

COLD WELDING USED—The technique of cold pressure welding has been used by General Electric Co., Ltd., of London, in the manufacture of medical X-ray equipment. It was used to seal hermetically the ionization chamber of a new "Watson" deep therapy unit.

STEEL FOR PAKISTAN — The Pakistan government has announced general acceptance of plans for establishing a steel industry in that country. A mission of experts from U. S. Steel Export Co. estimated Pakistan's requirements up to 1953 would be 260,000 tons yearly, rising to 600,000 tons in 70 years.

AUSTIN IN MEXICO—Austin Motor Co. is negotiating to establish an assembly plant in Mexico.

New Controls Cut Civilian Use of Copper, Increase Cobalt Supply

WASHINGTON — More cobalt and less copper will be available for non-military uses in the months ahead. This was clear when the government slapped tight controls on the two metals late in November.

• **Cobalt controls** were not new. With military and civilian demands far exceeding available supply, the National Production Authority first set a ceiling on non-military use during November. It did so by directing the sole importer of the metal to give civilian users 30% of the average monthly supply they received in the first six months of 1950.

NPA's latest move was to up civilian supply for December and put limits on rated (DO) use. Obviously, NPA suspected there was water in some of the rated orders for cobalt. The new directive assigned unrated users 50% of their January-July supplies of cobalt in metal form. Civilian users also received a quota of 45% on cobalt oxide for ceramics, for which there were no rated orders. On metallic oxide and cobalt fines civilian use was set 32% and 20%, respectively, of the quantities ordered for delivery in December.

Rated demands were cut back as follows: 60% of the metal ordered; 75% of metallic oxide and fines ordered.

At the same time NPA slapped an inventory control on all forms of cobalt—20 days' supply.

• **The copper orders** followed the pattern of earlier controls on aluminum. One slashed use of copper for non-defense production in the first three months of 1951 and set inventory limits on copper products. A second order translated the use cutback into plant-by-plant terms by setting limits on the rated orders fabricators must accept during any month.

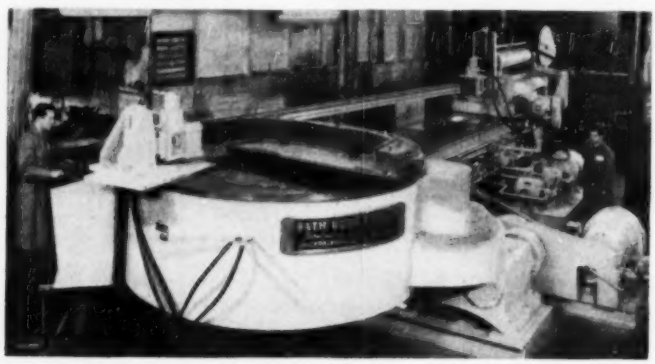
Two new wrinkles appeared in the copper orders. First, ingot producers were told they need accept no DO order that was not accompanied by a specific authorization by NPA. That stopped the previously endless extension of DO ratings at the fabricating level and guaranteed tighter NPA supervision of raw copper.

Also new was a clause in the usual provision for appeals of "hardship cases." NPA conceded that any "dislocation of labor and resulting unemployment caused by the order would constitute a "hardship case" qualified for an appeal for relief.

• **Limits set** on the volume of DO orders that brass mills must accept were as follows: Pipe and tubing, alloyed and unalloyed, 5% of average monthly shipments during the first six months of 1950; plate, sheet and strip, alloyed and unalloyed, 25%; unalloyed rod, bar and wire, 15%; alloyed rod, bar and wire, 20%; all other products, 15% each.

Copper wire mills may reject rated orders in excess of 15% of average monthly shipments from January through June. Foundries—makers of forgings and heavy castings—can reject rated over 10% of the average during the same base period. Tonnage limits for DO orders were set at 20% of the base period average for brass mill products; 5% for wire mill products, and 10% for foundry products.

Inventory limits on brass and wire mill and foundry products are 45-days' supply; and no user of copper in any form may keep more than 60 days' supply in inventory.



BENDS ALUMINUM, MAGNESIUM—This 50-ton Bath roto contour-former now in operation at Boeing Airplane Co., Seattle, is the largest machine of its kind ever built. It is used to bend either aluminum or magnesium parts into circular or semi-circular shapes

60,000 Machine Tools in Reserve May Be Borrowed or Rented

WASHINGTON—If you're having trouble getting down to work on an important defense contract because of an inability to get certain items of much-needed production equipment, you may be able to borrow or lease what you need from the Army, Navy, or Air Force. There are some 98,000 major items of production equipment on hand in the National Defense Reserve. About 60,000 of these are machine tools. This includes only those tools in the "dead reserve." Government holds title to many thousands more being used by industry already.

• **Prime contractors** who need tools should make appeals directly to their contracting officer. Sub contractors should apply through the prime contractor.

Whether the tools will be loaned to you or whether you'll have to pay lease on them depends on what kind of a contract you've got. Those working under "cost-plus" contracts will get them on loan—if the government charged for them, it would just be taking the money out of one pocket and putting it in the other. However, contractors operating under fixed fee or bid contracts will have to pay rent.

But don't count on getting a brand new tool all ready to go into operation. Munitions Board policy never has been to rebuild its tools into A-1 condition. However, government will pay costs of getting the tool in shape to do the job.

The condition of the particular tool that you get depends pretty much on where you get it. Generally speaking tools the Navy has will be in best shape. Those the Air Force has in the worst condition, and the Army somewhere in between.

Navy policy all along has been to remove and replace all worn and broken parts, and in many cases to store them in dehumidified warehouses. Air Force until recently just piled them into storage "as is." Army determined damaged, and listed parts need for each tool, but in general did nothing about replacing the parts. All electric motors were taken off and checked in the case of all three services. Few of the tools could be considered as having been rebuilt, and none of them have actually been power tested. All are in need of final adjustment.

• **In worst shape** are those tools that could be used for more than one purpose. Even Navy in many cases decided not to attempt to completely replace all worn parts, because they had no way of knowing which way the tools would be used.

New Munitions Board policy is to bring all tools up to Navy standards.

While in the past all tools in the Industrial Reserve have been those turned in from government-owned facilities, next year Munitions Board hopes to get some money for ordering new tools which are now in short supply, and which take a long time to manufacture.

Munitions Board has not tried to rebuild tools, except where an important tool was in such bad shape that it needed a complete doing over. In this case the tool was either sent back to the original manufacturer or to a qualified rebuilder for service.

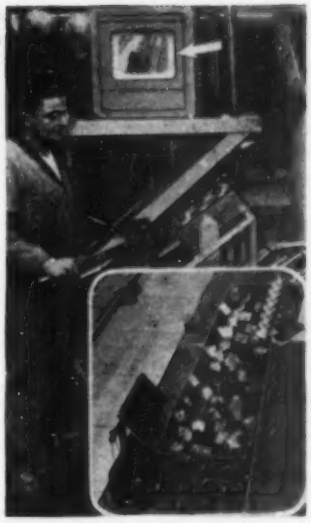
Munitions Board emphasizes that the tools are not represented as being "as-good-as-new"; that they're not available to industry as a permanent part of a production line. Rather MB looks on the tools as emergency stop-gap equipment to be used until new tools can be ordered and delivered.

300 Manufacturers Exhibit At ASME Power Show

NEW YORK — Advanced standards of design applied in modern power plants were featured by more than 300 exhibitors at the 19th national Power Show at Grand Central Palace Nov. 27-Dec. 2. ASME sponsored the exposition coincident with the society's annual meeting.

The array of machine tools and toolroom equipment included metal and woodworking machines, measuring instruments, hand tools, designing and drafting equipment, and considerable maintenance equipment.

The emphasis in exhibits was on improved methods and equipment for treating fuel before it enters the combustion chamber, including wider latitude in selection of fuel, hotter fire, improved heat extraction.



TV SHOW—Scrap baler operator at control panel in new Pittsburgh plant of Fisher Body Division, General Motors, watches television screen over his left shoulder to see when a car is loaded and ready to be moved by automatic controls so that another car may be loaded. Television camera is mounted on roof of building. Inset shows enlarged picture of view operator sees in television screen

Sales Representatives Named

• **Taft-Peirce Mfg. Co.,** Woonsocket, R. I., has named Gottsman Machinery Co., Detroit, exclusive representative for machine tool sales in Detroit, Toledo, and the eastern half of Michigan. Sales of gages and small tools will continue to be handled directly through the Taft-Peirce branch office in Detroit.

• **Reltool Corp.,** Milwaukee, has named Lyman B. Warren Co., St. Paul, Minn., manufacturer's representative in upper Michigan, western Wisconsin, Minnesota, North and South Dakota, and Nebraska.

• **Market Forge Co.,** Materials Handling Div., Everett, Mass., has named A-1 Industrial Equipment Co., Philadelphia, exclusive distributor for eastern Pennsylvania and southern New Jersey.

• **Burg Tool Mfg. Co.,** Los Angeles, has appointed R. A. Gorman eastern sales representative, with headquarters at 4126 Easton Ave., St. Louis.

MERGER PLANNED — Carborundum Co. of Niagara Falls, N. Y., and Minnesota Mining & Mfg. Co., St. Paul, Minn., are considering a merger.

MATERIALS SURVEYED—About 8000 of the nation's metalworking plants, large and small, have received questionnaires—NPA Form 1—asking for detailed figures on their use of aluminum, copper, steel, and magnesium, and shipments of products. NPA is counting on the questionnaire to help plan tighter controls over materials.

JETS COST MONEY—Problems of financing construction of a jet airliner were discussed recently by Fred Collins, sales vice president of Boeing Airplane Co., Seattle. Sales price of a large airliner would be about $2.5 million. Boeing would have to build 100 to make a profit, with output of four a month. This would require financing of $130 million to $150 million yearly.

J. CALVIN BROWN, new president of American Society of Mechanical Engineers

Small Manufacturers Must Invest In Modern Methods, Facilities, ASME Told

NEW YORK — Small plants and businesses have multiple advantages over large companies from the standpoint of labor and community relations, as well as in certain aspects of management, Don G. Mitchell, President, Sylvania Electric Products, Inc., New York said at the 1950 annual meeting of the American Society of Mechanical Engineers here Nov. 27-Dec. 1.

"Small business . . . has a fine future in this country," he said. But the consumer will demand "just as good a performance and just as low a price from the small as from the large producer and sometimes better. It is essential, therefore, that small plants be just as alert to modern practices and just as ready to invest in modern methods and facilities for improving products and reducing costs."

• **Among many technical papers** presented at the ASME meeting was one by W. R. Slattery of the Ford Motor Co. manufacturing engineering staff, who told how 25,000 pistons per day were produced using automation with quality control.

The automation system resulted in a substantial reduction in handling labor costs, a better utilization of direct labor by eliminating the need for the operator to load machines, in many cases, and a reduction of damage to the pistons due to parts striking together or dropping on the floor.

• **Hot machining of metals** was the topic of a paper presented by E. J. Krabacher and M. Eugene Merchant of Cincinnati Milling Machine Co. The paper revealed results of research on the influence of basic metal cutting quantities when machining metals at elevated temperatures. "The two main factors opposing each other in their effect on tool life in hot machining are the softening effect which increased temperature has on the tool and the abrading action of the chip and workpiece on the tool."

• **Super power** requirements of supersonic airplanes capable of flying 1700 mph were given by two Douglas Aircraft company engineers, Harold Luskin and Harold Klein.

"Engines required to ram airplanes through the air at 2½ times the speed of sound must produce three or four times as much thrust for their weight as engines acceptable for subsonic conventional aircraft." Mr. Luskin believes this goal is attainable in the near future through evolutionary improvement of jet engines and adding afterburners, which greatly increase normal power output of turbojets, especially at high speeds.

• **Elected president** of ASME for 1951 was J. Calvin Brown, engineer and patent attorney of Los Angeles, succeeding James D. Cunningham, president, Republic Flow Meters Co.

Highest award of the society, the ASME Medal, was presented to Harvey C. Knowles, vice president, Proctor & Gamble Defense Corp., Cincinnati, for contributions to the process industries and to the loading of ammunition.

Latest Defense Contracts: Major Awards for Engines,

ARMY

Chrysler Corp., Detroit, engines, complete, $1,273,500.

Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., bolts, $599,148; nuts, $59,834.

Lamson & Sessions Co., Cleveland, bolts, $281,695; hardware, $49,764.

Buffalo Bolt Co. Div., Buffalo-Eclipse Corp., North Tonawanda, N. Y., bolts, $155,149.

Michigan Bolt & Nut Co., Inc., Detroit, bolts, $184,748.

Diamond T Motor Car Co., Chicago, bushing, tubes, transmission, $336,140; carrier & cap assembly, adjuster, shield, etc., $50,066; kit, water pump repair, $65,446.

Chevrolet Motor Div., GMC, Detroit, automobiles, sedan, $1,314,819.

Federal Motor Truck Co., Detroit, shock absorbers, $386,700; clutch, mainshaft, assembly, $87,858; blade, pen, tappet, shaft screw, $41,396; plate, shoe, $268,239.

Chas. A. Strelinger Co., Detroit, milling machines, $102,024.

Sheldon Machine Co., Chicago, engine lathes, motor driven, $471,240.

Otis Elevator Co., New York, range finders, $2,200,000.

Gibbs Mfg. & Research Corp., Janesville, Wis., renovation & conversion of mechanical time fuzes, $1,662,000.

Sessions Clock Co., Forestville, Conn., head assembly for fuzes, $869,698.

Radio Corp. of America, RCA Victor Div., Camden, N. J., radio sets, and parts, $3,227,945.

Arma Corp., Brooklyn, N. Y., range finders, $4,100,000.

Mergenthaler Linotype Co., Brooklyn, N. Y., range finders, $1,800,000.

Long Mfg. Div., Borg-Warner Corp., Detroit, disc. clutch assembly, $1,027,636.

NAVY

General Metals Corp., Enterprise Div., San Francisco, various repair parts for diesel engines, $470,039.

Valley Forge & Car Co., Div. of McGrath & Co., Stillwater, Minn., landing mats, $238,231.

Fleetwood Airflow, Inc., Wilkes-Barre, Pa., storage cabinets, $546,710.

Banner Bed Co., Chicago, beds, section, single type steel, $436,060.

Vickers, Inc., Div. of Sperry Corp., Detroit, pumps, hydraulic engine driven for use on aircraft, $267,720.

Westinghouse Electric Corp., Philadelphia, relay assemblies, control panel, contractor generator, regulator, for use on aircraft, $456,774.

Clark Equipment Co., Buchanan, Mich., trucks & tractors, $198,793; tractors, gasoline powered, $158,423.

Bethlehem Steel Co., Bethlehem, Pa., steel hull plates & steel marine boiler plates, $1,000,000.

Superior Sleeprite Corp., Chicago, beds, double deck, metal, $137,934.

Chance Vought Aircraft Div., United Aircraft Corp., Dallas, Tex., spare parts, maintenance for aircraft, $763,148.

Lyons Storage Battery Div., Price Battery Corp., Hamburg, Pa., batteries, storage, portable lead, acid, Navy type, $276,250.

Standards Urged To Speed Output

NEW YORK—A means of producing required war materiel without cutbacks in civilian goods so drastic that they would disrupt the economy was offered by Roger E. Gay, president, Bristol Brass Co., Bristol, Conn., at the opening session of the three-day National Standardization Conference sponsored by the American Standards Association at the Waldorf-Astoria Hotel Nov. 27-29.

A partial solution to the problem, Mr. Gay stated, lies in the national standardization for war use of those millions of items of civilian manufacture that, with little or no change, can be used as war products.

• **Case histories of savings** through standardization of purchasing procedures were presented at a panel discussion sponsored by the Committee on Standardization sponsored by the National Association of Purchasing Agents.

Ford Motor Co.'s work in standardization was described in the panel by George M. Rice of the Lincoln-Mercury purchasing department. Mr. Rice revealed the results of standardization studies begun six months ago throughout 38 Ford plants and branches. The studies, he said, are expected to save the company several hundred thousand dollars annually in procurement costs.

A recently-completed study on connecting-rod operations, according to Mr. Rice, has resulted in replacing a special-length company standard drill with a drill having an industry-wide standard. He estimates the annual savings at $3,500 through longer tool life and lower unit cost.

As a result of these savings, Mr. Rice said, the company is now conducting time tests on form tools, drills, reamers, taps, broaches, and grinding wheels.

REELECTED to his third term as president of ASA was Thomas D. Jolly (left), vice president, Aluminum Company of America. Newly elected directors were Charles W. Bryan, Jr., president, Pullman-Standard Car Mfg. Co., Chicago and H. S. Sizer (right), assistant to the director of design, Brown & Sharpe Mfg. Co., Providence

• **Two advantages of standardization** are "lower inventory, with fewer sizes and more interchangeability, and lower purchase price through quantity buying," declared Col. J. G. Vincent, vice president, Packard Motor Car Co.

"Standardization can mean shorter set-up time, faster processing, fewer changeovers and longer runs. It can mean larger production units; smoother production flow; and simplified storage, distribution and marketing problems. Inspection requirements can be simplified through quality control," Col. Vincent said.

Howard Coonley, conservation consultant to NSRB, told of development of the Munition Board's Supply Catalog which sprang from the Hoover Commission's estimation that "hundreds of millions of dollars could have been saved in World War II if military supplies had been uniformly cataloged."

Mr. Coonley was first recipient of the ASA's "Howard Coonley Medal" awarded for leadership in the advancement of the national economy through voluntary standards.

Faced with a Congress opposed to the Federal Trade Commission's previously stated views on "freight absorption" and "conscious parallel action," the FTC will restudy its stand on those two business monopoly questions, it was indicated by Lowell B. Mason, FTC member, addressing the ASA gathering. The latter theory, in which orders were issued against businessmen without first finding them guilty of following conscious parallel action in business, will be allowed to "wither on the vine," Mr. Mason said.

Electronic Equipment, Aircraft, Hardware Items

Raytheon Mfg. Co., Waltham, Mass., electron tubes, $1,171,365.

Bomac Laboratories, Inc., Beverly, Mass., electron tubes, $243,500.

General Electric Co., Schenectady, N. Y., electron tubes, $590,920.

Sylvania Electric Products, Inc., Electronics Div., electron tubes, Boston, $364,200.

Amperex Electronic Corp., Brooklyn, electron tubes, $412,500.

Continental Electric Co., Geneva, Ill., electron tubes, $147,000.

Kuthe Laboratories, Inc., Newark, N. J., electron tubes, $166,400.

AIR FORCE

Douglas Aircraft Co., Inc., Santa Monica, Calif., aircraft spare parts, $1,160,981.

A. B. Dick Co., Chicago, duplicating machinery, $101,049.

Biederman Motors Corp., Cincinnati, spare parts for compressors, tractors, generators, $582,785.

Doebbe Metal Furniture Co., Inc., New York, office furniture, $808,478.

Addressograph-Multigraph Corp., Cleveland, duplicating machinery, $250,675; printing presses & attachments, $161,367.

John Bean Div., Wood Machinery & Chemical Corp., Lansing, Mich., assorted tool sets, $167,901.

Electric Storage Battery Co., Cleveland, aircraft storage batteries, $446,720.

Sperry Gyroscope Co., Great Neck, L. I., N. Y., automatic pilot parts & tools, $372,580.

Vickers Inc., Detroit, pump assemblies, $283,611.

Sundstrand Machine Tool Co., Rockford, Ill., alternator drives, $1,119,710.

General Electric Co., Schenectady, N. Y., turbosupercharger regulator spare parts, $140,420; engine spare parts, $44,995.

M B Mfg. Co., Inc., New Haven, Conn., engine mounts, $257,400.

Cessna Aircraft Co., Wichita, Kans., aircraft, $1,645,000.

Hallicrafters Co., Chicago, radio receivers, $1,492,646.

Airesearch Mfg. Co., Garrett Corp., Los Angeles, turbines, $116,700.

Thompson Products, Inc., Cleveland, pump assemblies, $201,881.

Gilfillan Bros., Inc., Los Angeles, radar sets, $5,795,180.

B. F. Goodrich Co., Akron, Ohio, misc. deicer shoes, $752,474.

Wolverine Diesel Power Co., Detroit, portable electric plant, $282,716.

Hackensack Cable Corp., Hackensack, N. J., tow target cable, $348,705.

Marlin-Rockwell Corp., Jamestown, N. Y., ball bearings, $187,935.

Ahlberg Bearing Co., Chicago, ball bearings, $125,951.

Schwien Engineering Co., Los Angeles, vertical gyro indicators, $117,900.

Stewart E. Brown Mfg. Co. Inc., New York, lamp assemblies, $144,336.

Taylor-Wharton Iron & Steel Co., Dayton, cylinder assemblies, $140,421.

Harrisburg Steel Corp., Harrisburg, Pa., cylinder assemblies, $214,026.

Arthur E. Raabe

Robert A. Bode

C. E. Buchholzer

Thomas C. Gray

Names in the News

Arthur E. Raabe has been named general manager, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J. Mr. Raabe, a Bendix vice president, succeeds as general manager **Raymond P. Lansing,** Bendix vice president and group executive in charge of Eclipse-Pioneer, Scintilla-Magneto Div. at Sidney, N. Y., the Red Bank Div., Red Bank, N. J., and the Friez Instrument Div., Baltimore. Mr. Lansing will now devote his full attention to expansion of these division operations.

Robert H. Evans has been named executive assistant to the president and executive committee of Olin Industries, Inc. **Harry F. Devens** has been named staff assistant to the executive group of Western Brass Mill Div. of Olin. **Burvee M. Franz,** superintendent of the cartridge division, has been named assistant works manager, Winchester Repeating Arms Co. Div. of Olin. **Leonard K. Brown** succeeds Mr. Franz as superintendent.

James P. Glidden, Donald A. Beardsworth and **Joseph E. Curry** have joined the sales force of Hunter Spring Co., Landsdale, Pa., under a sales reorganization plan involving new allocation of territories as follows: **Bill Sohl,** western Pennsylvania and eastern Ohio; **Del Bennett,** New York State except New York City; **Sam Whitely,** eastern Pennsylvania (except Philadelphia), Delaware and Maryland; Mr. Glidden, Massachusetts, New Hampshire, Vermont and Maine; Mr. Beardworth, Connecticut, Rhode Island and New York City; Mr. Curry, New Jersey, and **John Sigafoos,** Philadelphia county.

Robert A. Bode has been named sales manager, and **J. James Tasillo,** assistant sales manager, of Hartford Special Machinery Co., Hartford.

C. E. Buchholzer has been named president, Airtemp Div., Chrysler Corp. succeeding **W. C. Newberg** who was named vice president and director of the Dodge Division.

A. H. Engstrom has been named acting engineering manager for American Hammered Piston Rings manufactured by the Metal Products Div., Koppers Co., Inc., Pittsburgh.

B. W. Westcott has been elected vice president, Howell Electric Motors Co., Howell, Mich. **James F. Murphy** has been named general sales manager.

Herman D. Rowe has been named manager of Ford Motor Co.'s new engine plant under construction at Cleveland. Since early this year he has been assigned as co-ordinator to work with central staff managers in setting up new motor plants in the Rouge and at Cleveland.

Bruce Smith has been named director of engineering, Ryan Aeronautical Co., San Diego. He was formerly chief engineer of Ryan's Airplane Division. **W. T. Immenschuh** has been named executive engineer.

Richard Seipt has been named vice president and general manager, Laminated Shim Co., Inc., Glenbrook, Conn. He was vice president in charge of sales, being succeeded there by **Merle L. Lockwood. Michael E. Errico** has been named sales manager.

Thomas C. Gray has been named director of engineering, Pullman-Standard Car Mfg. Co., Chicago. He joined the company in 1949 as manager of engineering production. As a Navy captain during the war, he was industrial manager of Guam. Previously he was chief engineer for Barco Mfg. Co. and for Franklin Railway Supply Co., Inc.

Lawrence M. Rich has been named vice president and general sales manager, Plomb Tool Co., Los Angeles.

Ab Martin has been named assistant manager, Ft. Wayne (Ind.) Works of General Electric Co.'s Apparatus Dept. He was formerly manager of the Oakland (Calif.) Works. Other Apparatus Dept. appointments: **W. C. Harris,** manager of engineering, Locomotive & Car Equipment Div., succeeding **H. W. Gouldthorpe,** named manager, Transportation Div.; **R. A. Hutchins,** assistant to the manager, Locomotive & Car Equipment Div.; **K. N. Bush,** production manager, Large Apparatus Div., succeeding **T. F. Garahan,** named vice chairman, Mobilization Planning Committee; **William N. Oberly,** assistant to the manager of manufacturing, and **William R. Boggess,** assistant manager of sales, Fractional Horsepower Motor Div.; **Charles Stoeckly,** sales div. manager, **Carl J. Anderson,** manufacturing div. manager, and **L. A. March,** engineering div. manager, Small & Medium Motor Div. of the San Jose (Calif.) Motor Div.; **Bascom H. Caldwell, Jr.,** assistant manager of engineering, and **D. E. Brainard, Howard D. Snively, Robert V. Shepherd** and **Robert W. Wieseman,** division engineers, Large Motor & Generator Engineering Div.; **William B. Snyder,** assistant manager, Steel Mill Div.; and **Allan L. Davis,** manager of service, Transportation Div.

Herbert J. Werner

Howard M. Palmer

Paul J. Roddy

Frank H. Higgins

Herbert J. Werner has joined Columbia Machinery & Engrg. Corp., Hamilton, Ohio, as chief engineer of the Mechanical Press Div. Previously he had been development engineer, Clearing Machine Corp.; staff engineer, E. W. Bliss Co., and was associated with Marquette Tool & Mfg. Co.

Ralph L. Robinson has been named vice president, Brake Shoe & Castings and Southern Wheel Divisions, American Brake Shoe Co., New York. His offices will be in Chicago. **Edward R. Anderson** has been named vice president of the Brake Shoe & Castings Div., with offices in San Francisco.

Walter J. Barz has retired as treasurer of Danly Machine Specialties, Inc., Chicago. He is continuing as a director. **Paul L. Lawless,** comptroller, was elected treasurer to succeed Mr. Barz.

S. E. Biggs and **James A. Bardsley** have been elected vice presidents of Trailmobile Co., Cincinnati. Mr. Biggs heads manufacturing operations in plants in Cincinnati; Springfield, Mo.; Berkeley, Calif.; and Windsor, Canada. Mr. Bardsley is in charge of Pacific Coast operations, with headquarters in Berkeley.

Tracy C. Jarrett has been named midwest representative, C. I. Hayes Inc., Providence, R.I. He will be located in Denver.

Raymond T. Porter has been named eastern sales manager, Heppenstall Co., Pittsburgh. His headquarters are at Bridgeport, Conn.

Robert F. Moody has been named assistant sales manager in the eastern division of Hyster Co., Portland, Ore. He will make his headquarters in Peoria, Ill.

Howard M. Palmer has been named general sales manager, Lewis-Shepard Products, Inc., Watertown, Mass. He has directed sales for the company's Power Division since the war. During the war he was assistant materials superintendent in charge of materials handling at Bethlehem Bingham Shipyard.

William A. Blume has been named administrative vice president, Asbestos Mfg. Co., Huntington, Ind. He was formerly president, American Brakeblok Div., American Brake Shoe Co., and vice president of the parent company.

William H. Morse has been named manager of the ac mechanical engineering section, Transportation & Generator Div., Westinghouse Electric Corp., East Pittsburgh, Pa. He succeeds the late **A. C. Larson.**

Donald E. Randall has been named manager, Sao Paulo (Brazil) branch of Independent Pneumatic Tool Co., Aurora, Ill.

B. C. Blake has been named vice president and general manager, Connors Steel Co., Div. of H. K. Porter Co., Inc., Birmingham, succeeding **H. P. Bigler,** resigned. **Lawrence L. Garber** has been named general manager of the American-Fort Pitt Spring Div., McKees Rocks, Pa.

William E. McCoy has been named assistant sales manager, Central Div., Caterpillar Tractor Co., Peoria, Ill., succeeding **Herman Eberling,** returned to active duty in the U.S. Corps of Engineers.

Walter K. Deacon has joined the engineering staff of McCulloch Motors Corp., Los Angeles. Previously he was with Marquardt Aircraft Co. as assistant to the manager of engineering and manufacturing.

Paul J. Roddy has been named assistant domestic sales manager, Nicholson File Co., Providence, R.I. He assumes the duties of **Edmond A. Neal,** who has been advanced to domestic sales manager. Mr. Roddy has been serving since 1947 as district manager of the Metropolitan New York-New Jersey territory.

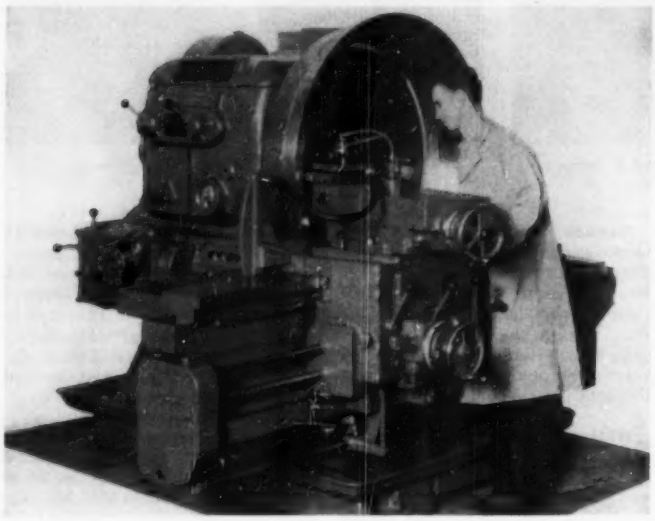
Frank H. Higgins has been named president of the newly established Alexander Smith Products Co., Yonkers, N.Y. From 1945 to 1947 Mr. Higgins was, successively, president and director of Fostoria Screw Co., Fostoria, Ohio, and vice president and head of the Detroit plant of Hupp Corp. The new company, a division of Alexander Smith & Sons Carpet Co., was formed to develop and market products other than floor coverings.

Philip L. Ward has been named assistant chief engineer of the newly-formed Development Engineering Div., Solar Aircraft Co., San Diego. **Capt. Samuel J. Zeigler,** USN, ret., succeeds Mr. Ward as eastern engineering representative at Washington, D.C.

Hobart A. Green has been named president of Royal Metal Mfg. Co., Chicago, and of Royal's subsidiary, Deluxe Metal Furniture Co., Warren, Pa., succeeding the late **Irving Grombacher. Joseph K. Salomon** has been named president of two subsidiaries, Royal Metal Mfg. Co. of California and Hudson Beauty Furniture Co., both Los Angeles.

John Hellstrom, vice president, American Air Filter Co., Inc., Louisville, Ky., has been named manager of the newly created Pacific Div., San Francisco. He will supervise activities of both American Air Filter Co. and its Herman Nelson Div. of Moline, Ill., in the Pacific territory.

New Shop Equipment



Chucking Lathe Uses T-Formation To Handle Thin-Walled Work

Max. swing over bed	60 in.
Swivel range of compound rest	90°
Number & range of spindle speeds	24; 4-225 rpm
Number of feeds; carriage & compound rest	55
Range of feeds	0.001 to 0.064 in.
Power rapid-traverse rate	10 ft/min

The right-angle chucking lathe was developed for facing, turning, and boring thin-walled work of large diameter and short length. It is claimed that using a bed in the shape of a T displaces cumbersome straight-line lathes for this class of work. For example, a battery of 5 of these lathes would save approximately 50% in floor space. Conventional lathes of this capacity placed end to end would require up to 75 feet of space. The T-lathes require no more than 35 ft.

Facing at right angles to the centerline of the lathe can be accomplished by movement of the carriage. Facing can be done for a total of 31 in. from the centerline to the left of the operator. There is also a 6-in. over-travel to the right.

The top slide is designed to have power angular feed in any direction and a total travel of 16 in.; 12-in. forward (max. depth of workpiece) and 4-in. back. Thus, straight or taper boring or turning can be accomplished.

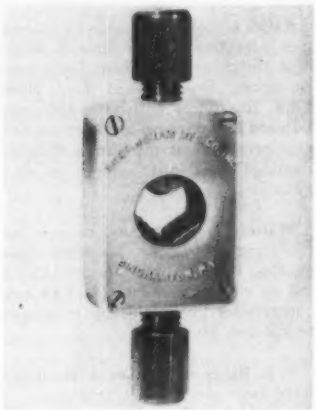
Four headstocks may be used (all Model X): 25-in. standard hollow spindle, 8 7/8-in. hole; 25-in. heavy duty hollow spindle, 11½-in. hole; 25-in. standard; and a 25-in. heavy duty. Hollow spindles are used in order that workpieces that have an extension which will not be machined can be chucked in such a way that the extension can protrude through the hole.

The workpieces handled best are generally light in weight, large in diameter, and relatively short in length, as the lathe was designed to fill a specific need and is, in fact, now being used on a variety of turbo-jet engine parts being machined by Pratt & Whitney. The materials commonly used are stainless steel and the lighter alloys. The machine is designed, therefore, to be controlled in such a manner that the operator may readily follow the path of the tool and easily take required dimensions. The operator has full control of all operating functions at the apron position. The lathe, however, is still a general-purpose machine. Its physical limitations do not require that it be used on just a few parts.

Other design features include: Independent control of the facing and turning feeds in either direction. Direct-reading dial and counter for the diameters. Direct-reading dial for lengths. Special pads on both sides of the facing carriage for use with gage blocks.

The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

(MORE DATA? CIRCLE FYI 31, p. 195)



Buckingham Thread Restorer Works in Close Quarters

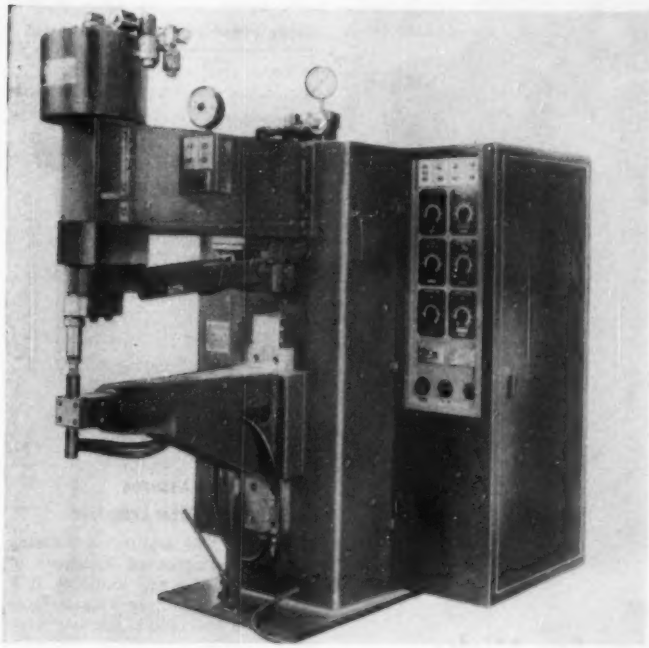
This thread restorer is suited for reconditioning closely spaced studs and bolts that are battered, distorted or rusted. It completes a range of sizes which take care of all ASME and SAE standard threads from ¼- to 4-in. diameter.

Adjustable cutting jaws can be fitted by a simple twist of the handle to any male thread of ¼- to 1-in. root diameter, either right- or left-hand. The jaws may be engaged at the bottom of the threaded section, and turned out toward the top. A swing of only 2 5/16 in. permits it to work well in close quarters.

Buckingham Mfg. Co. Inc., Binghamton, N. Y.

(MORE DATA? CIRCLE FYI 32, p. 195)

Materials and Parts



Spotwelder Controls Current To Fit Material Being Welded

The three-phase Moduwave welder tailors the current-wave shape to conform with the nature of the material being welded. Such divergent materials as aluminum and magnesium alloys, low-carbon steels, austenitic steels, nickel alloys, etc., can be welded with a simple change of control settings.

Current rise—the machine is said to achieve a welding current best suited for the proper preparation of the surfaces, and for avoiding electrode-tip pick up. The current density increases as the welding area increases, eliminating spitting and electrode-tip deterioration.

Current-magnitude control—three-phase current, together with stepless phase-shift heat control, may be altered to suit the thinnest or thickest materials.

Current-decay control—the metallurgical structure of the weld nugget is governed to a great extent by the recrystallization of the metal during the cooling period. A decay control allows precise control of the cooling rate of the nugget formed.

Current direction — succeeding pulses of alternating polarity are used to equalize heating of the electrode tips, thus increasing tip life.

Variable-pressure cycle and controlled forging—the point of application of the forging pressure in relation to the peak of welding current should vary with gage thickness to obtain optimum weld quality. This is controlled by a simple knob adjustment. The magnitude of the weld and forging pressures are both controlled by an adjustable regulator.

The total stroke is 4 in., with a working stroke of ½ in. and a retraction stroke of 3½ in. Depth of throat is 36 in. Rating is 100 kva at 50% duty cycle, operating on 220 and 440; three-phase, 60 cycle.

Sciaky Bros. Inc., 4915 W. 67th St., Chicago 38, Ill.

(MORE DATA? CIRCLE FYI 33, p. 195)

... INCLUDING

Gear tester checks pinions for nicks by running them in mesh with a master gear.....page 188

Shaper has a duplicator attachment to permit contour work on dies and other parts...page 189

Tool grinder has the table fixed as to vertical or transverse movement .....page 190

Tube-bending press uses a multiple-index stop that is said to end over-run .....page 192

Electromagnetic clutches use a graphite mixture to produce friction without wear.....page 194

Metal-cutting bandsaw can be operated semi- or completely automatically .....page 200

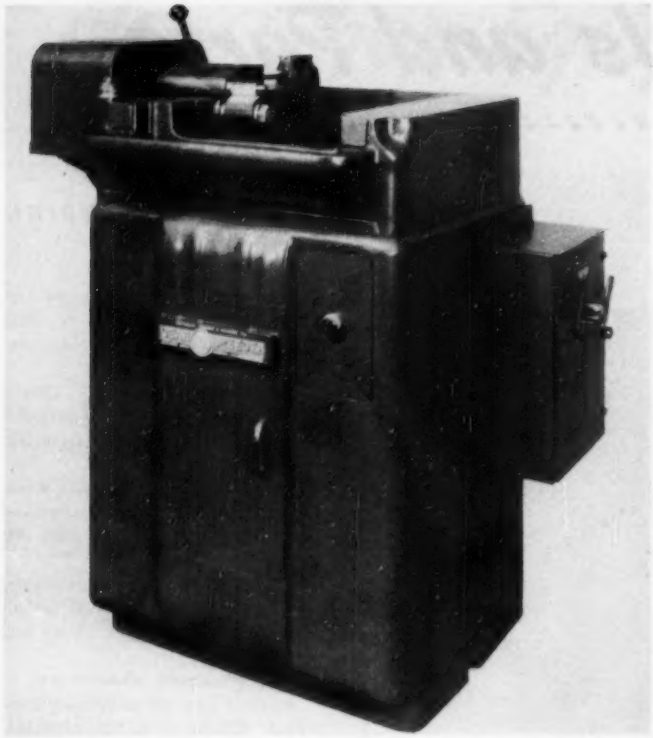
Grinder and lapper uses toolholder which slides on a bar parallel to spindle .....page 202

NEW BULLETINS for your Shop Library, including a slide chart for annealing alloy steels to produce spheroidal and lamellar structures ... pages 195 and 196

... and in December 25

Toolroom lathe has a bed of deep cross-section for rigidity; changes in threads or feeds can be effected by turning single knob.

Oil-hydraulic press of 50-ton capacity has approach and pressing speeds independently adjustable.



Red Ring Gear Tester Quickly Checks Pinions for Nicks

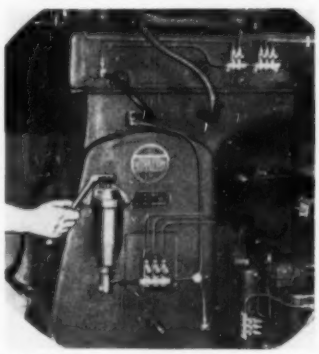
This Red Ring machine is being used to test automatic-transmission pinions for nicks by running them in mesh with a master gear. A power spindle, on which is mounted the master gear, drives the work pinion which is merely slipped onto its spindle in the rocking workhead—no retaining work fastener is needed. The workhead rocks about a central fulcrum with a compression spring holding it at an elevation which allows the pinion and master gear to be in loose mesh. This enables the work pinion to be slipped on and off readily. In this position, a safety electrical interlock prevents the power from being turned on.

The rocking handle is pulled forward to bring the two gears in close mesh, or to a predetermined center distance. By pressing a start button the test begins.

As soon as the rocking handle is allowed to return to its initial position, power is cut off and a solenoid-operated brake goes into action to stop rotation of both gear and pinion for unloading and reloading the next workpiece. The operator is protected by the immediate brake action when power is shut off.

National Broach and Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.

(MORE DATA? CIRCLE FYI 34, p. 195)



Lincoln System Provides Centralized Lubrication for Bearings

Known as the CenterOiler, this system provides centralized lubrication for all machine bearing points requiring periodic applications of oil. It is said to insure that every bearing receives the right quantity of oil by positive pressure displacement. It affords visible indication that each bearing is being lubricated.

Lincoln Engineering Co., 5984 National Bridge Ave., St. Louis 20, Mo.

(MORE DATA? CIRCLE FYI 35, p. 195)

Air-Line Filter Assures Full Air Flow After Long Use

Filter No. 3084 features a filtering element composed of hundreds of laminations of a fine material. It is said that the filtering area is large enough to assure full air flow even after long periods of use. Moisture is removed through a drain cock.

Available in three standard pipe sizes: 1/4, 3/8 and 1/2.

A. Schrader's Son Div., Scovill Mfg. Co. Inc., 470 Vanderbilt Ave., Brooklyn

(MORE DATA? CIRCLE FYI 36, p. 195)

American-Optical Metallograph Features Simplicity of Operation

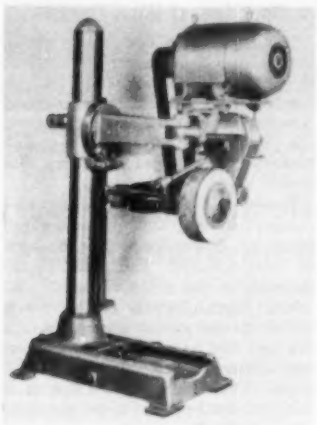
Designed as a routine control instrument, this metallograph has all the controls and adjustments within

easy reach. Directly in front of the operator are the 5 x 7-in. camera, the monocular or binocular microscope eye pieces, and the ball bearing mechanical stage. Within easy reach is the electrical control panel for the arc and visual lamps. All other controls are operable from a sitting position.

Grain-size measurements, ferrous or non-ferrous, are compared directly on the ground glass with standard grain-size charts. Case depth and linear measurements are easily and accurately made with an accessory micrometer rule.

American Optical Co., Instrument Div., Buffalo, N.Y.

(MORE DATA? CIRCLE FYI 37, p. 195)



Murray-Way Polishing Heads Can Operate on 3-Ft Centers

These units, to be known as the 60 series, are available in two standard sizes. No. 61, rated at 10 to 15 hp and the No. 62 rated at 5 to 7½ hp.

The heads will operate either right- or left-hand, without extra brackets or extensive mechanical adjustment. They can operate at 3-ft centers, thus greatly reducing the required diameter of the dial tables and permitting economies in the length of conveyors and the number of fixtures required. Pneumatic controls assure constant work pressures.

Murray-Way Corp., Detroit, Mich.

(MORE DATA? CIRCLE FYI 38, p. 195)

Aluminum Hand Torch Has Greater Fuel Capacity

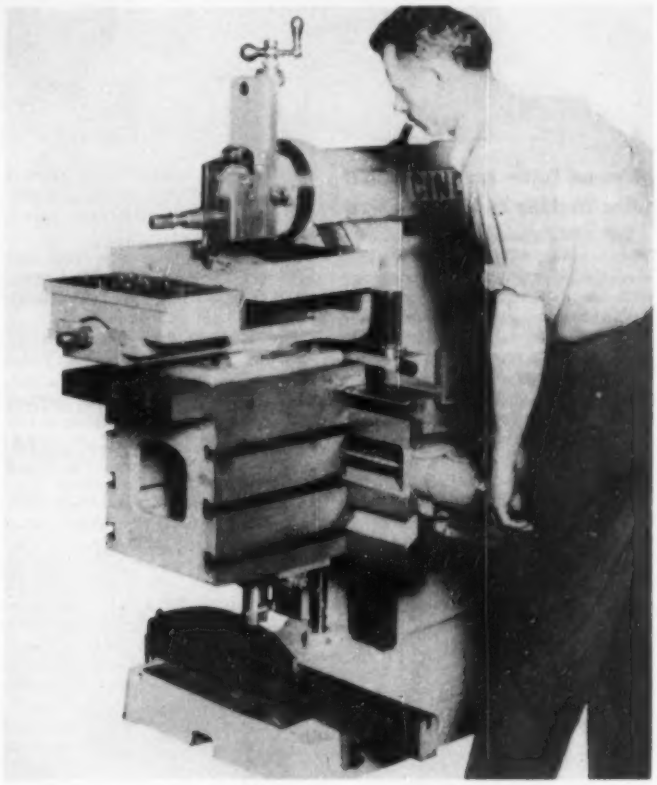
Features of this aluminum torch are a stronger, flared tank design, resulting in greater fuel capacity; weight balance at any fuel level; and better appearance.

Simplified construction reduces number of parts from 16 to 8, minimizing mechanical troubles and repair costs. A more efficient check valve is claimed to make pumping twice as easy and faster than formerly, and eliminate need for lock down after pumping. A safety feature is a lockring on the needle valve which cannot be forced out by pressure, preventing the flame from shooting out back of the torch.

The aluminum construction eliminates soldered bushings on pump and burner joints, making the joints leakproof.

Otto Bernz Co., Rochester, N.Y.

(MORE DATA? CIRCLE FYI 39, p. 195)



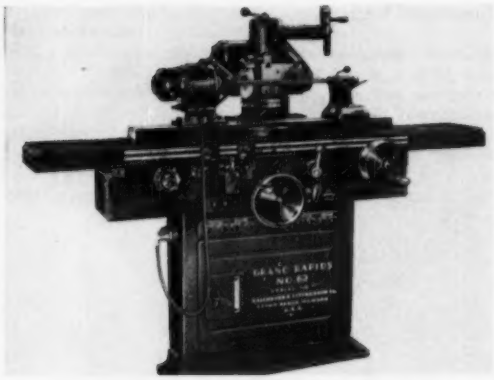
Duplicator Attachment on Shaper Permits Contour Work on Dies

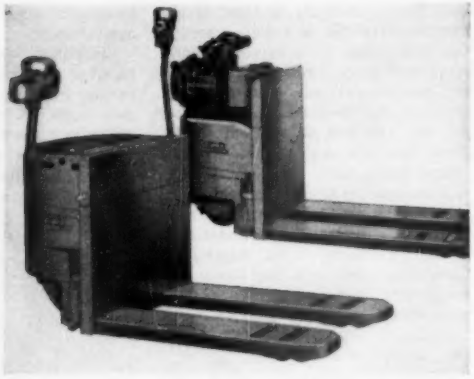
The machine illustrated is used for automatically shaping contours on dies, clamps, cams and other parts without laying the contour on the work and cutting to a line as is normally done. The shaper is a standard machine except for the pad on the base, the master-form holder, and a table support post. It can be used for regular work as well as automatic duplicating.

The rail elevating screw is disconnected and retraced when duplicating so that table and rail are free to move vertically. They are supported on the master form by the steel support post equipped with a roller. The master form to be duplicated is made of ½-in. steel and clamped in the holder that is secured to the pad on the base. The table progresses horizontally by automatic feed. The table, rail, and work follow the vertical and horizontal movement of the roller as it travels over the master form.

The Cincinnati Shaper Co., Hopple, Garrard & Elan Sts., Cincinnati 25, Ohio

(MORE DATA? CIRCLE FYI 40, p. 195)





Universal Cutter and Tool Grinder Takes Work Up to 12-In. Diameter

Two table movements are fixed on this grinder. The Grand Rapids Model 62 is a cabinet-base machine with many operational features such as anti-friction ball bearing table with the ball bearings carried in a micarta track, raising and lowering of the grinding-wheel head and the cross feeding of the head and column so that the sub-table and table remain fixed as to vertical or transverse movement.

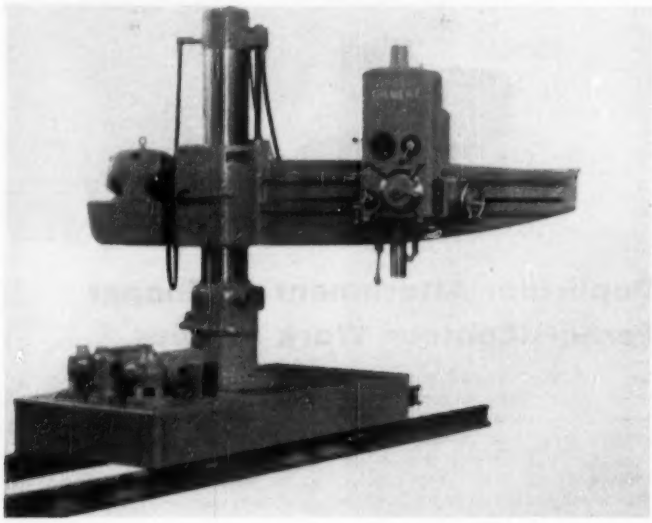
Power feed, optional on the No. 62, provides for an infinite number of longitudinal table feeds from 4 to 100 ipm. Master handwheel provides three longitudinal table speeds of ½, 3½ and 8¼ ipr.

Guarding against grit and dirt getting into the bearings, the vertical movement has dove-tailed ways and telescopic guards.

The table is 6-in. wide x 42-in. long with a single 9/16-in. T-slot running its entire length. The machine takes 20 in. between centers and has a longitudinal table movement of 24 in.

Gallmeyer & Livingston Co., Grand Rapids, Mich.

(MORE DATA? CIRCLE FYI 41, p. 195)



RADIAL DRILL has a base 46-in. wide by 90-in. long, which will ride on standard Cincinnati Gilbert horizontal boring-mill runways, or 100-lb. rails. The gage is 3 ft. Power traversing and clamping equipment is optional. Under power the unit traverses at a rate of 50 fpm. Both axles rotate in Timken tapered roller bearings, and all mechanisms operate in oil or are permanently lubricated.

— The Cincinnati Gilbert Machine Tool Co., 5366 Beekman St., Cincinnati 23, Ohio.

(MORE DATA? CIRCLE FYI 42, p. 195)

Battery, Gasoline-Engine Models In Clark Line of Hand Trucks

Hand trucks in two power types, but of one basic design, have been developed by Clark. One of the trucks, the Electro-Lift, is battery-powered with motor drive; the other, the Hydro-Lift, is gasoline-engine powered with hydraulic pump and motor drive.

Noteworthy features claimed are: compact design, high maneuverability, ample power for peak loads, ease of maintenance, and the motor mounted in the drive wheel.

The Electro-Lift is driven by a GE compound motor which develops 1¼ hp—said to be more power than any other electric-powered hand truck. The Hydro-Lift engine is a two-cylinder opposed type, air cooled, and rated at 5.5 brake-horsepower at the governed speed of 2800 rpm. A mechanical governor and fuel pump are standard equipment. Both models are rated up to 6000-lb. load capacity. Mechanical brakes, self-energizing, are actuated by movement of the handle to extreme position, either up or down.

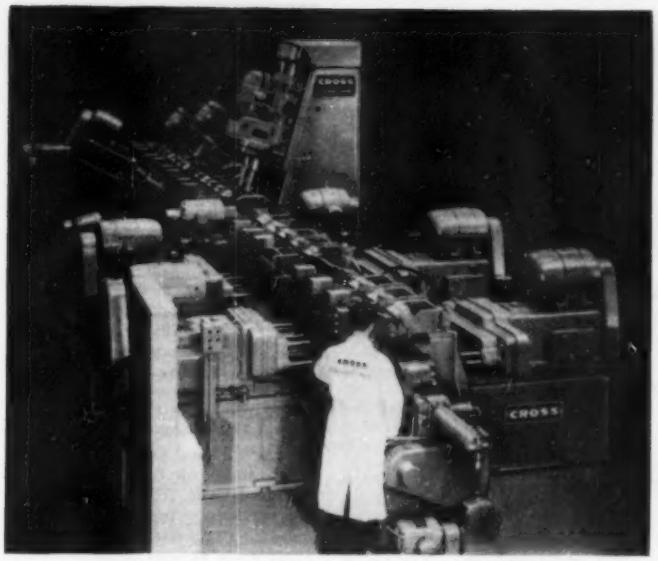
Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.

(MORE DATA? CIRCLE FYI 43, p. 195)

Fused lens, bi-colored, is designed to protect the eyes of workers engaged in heat-treating and furnace operations. Instead of fitting two half lenses, the single lens can be fitted in a fraction of the time normally required. The fusing process is also said to eliminate the possibility of light streaks being present. They are beveled to fit spectacle goggles or cup-type goggles and are made in regular and 6-curve, round and FV3 shapes.

American Optical Co., Southbridge, Mass.

(MORE DATA? CIRCLE FYI 44, p. 195)

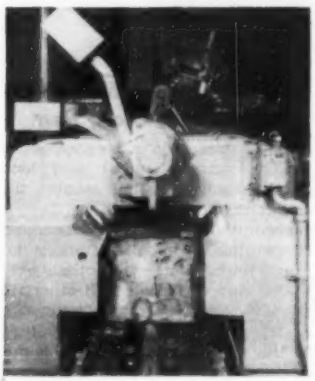


Transfermatic, first of two, drills the straddle-milled ends of the gear box. Tapping and milling are also done on this machine

Hydraulic Controls Installed in Cross Transfermatic Machines

Two Transfermatics do all the drilling, reaming, tapping, spot facing, and considerable milling on transmission gear boxes made by the Warner Gear Div. of Borg Warner. The cycle time is 42 sec and at 100% efficiency 86 cases per hour are machined.

There are 104 individual operations. 69 drilling, 22 tapping, 7 milling, 5 reaming, and one counterboring.



First station shows the ways with chip clearance grooves, transfer bar beneath the work, clamping plate on top of the work and the clamping weights

An interesting feature is the elimination of some 100 electric controls by the use of a hydraulic-mechanical control system. One hydraulic cylinder on each of the machines controls the clamping of the work. It pulls the clamps back to release the workpieces and holds them back during transfer. The actual clamping is done by gravity weights through cams that bear on pressure plates.

Four cylinders are used to locate the work with two pins at opposite corners of the locating face. These engage two construction holes drilled in the pan face on the first operation. The pins are raised and retracted by the cylinders turning separate shafts on each side of the work rail. These shafts are tongue and grooved at opposite ends so that any section of the Transfermatic can be quickly removed for service without disturbing the adjacent units. In all, 48 hydraulic cylinders are used; 38 for feeding the tools, 4 for locating the work, 4 for transferring the workpieces, and 2 for unclamping the work.

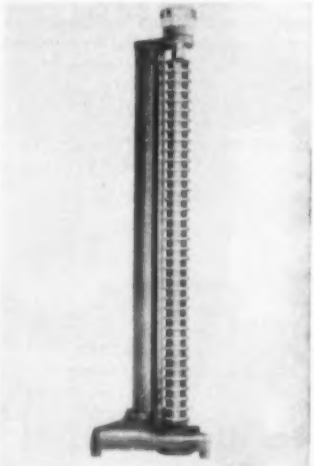
A Cross machine-control unit with Toolometer automatically stops the machine when any tool requires changing; preset tools reduce downtime.

The Cross Co., Detroit 7, Mich.
(MORE DATA? CIRCLE FYI 55, p. 195)

SPO Layout Table Moves 360° Radially, 90° Vertical Arc

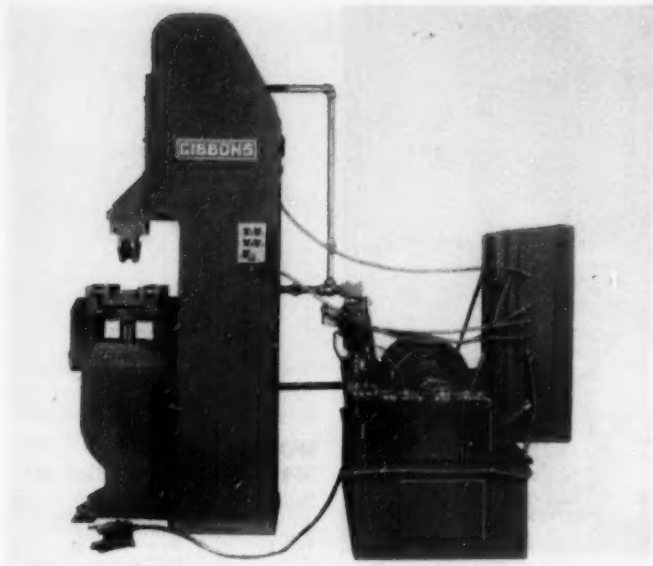
Using a 30-in-diameter rotary table, the Series No. 30 utilizes an indicator and vernier on an adjustable arm to permit direct readings, accurate to within ten minutes. This indicator assembly can be set to operate on either side of the table or at any intermediate position. Circumference is graduated in ½° markings.

SPO Inc., 6430 Grand Division Ave., Cleveland 5, Ohio
(MORE DATA? CIRCLE FYI 56, p. 195)



HEIGHT GAGE, 36-in. model, rounds out the line of Pla-Chek gages that were introduced five years ago. It is made from hardened-steel bar that contains 36 steps, spaced exactly 1-in. apart. Measurements are claimed to be accurate to 0.0002 in.

Cadillac Gage Co., 20316 Hoover Rd., Detroit 5, Mich.
(MORE DATA? CIRCLE FYI 57, p. 195)



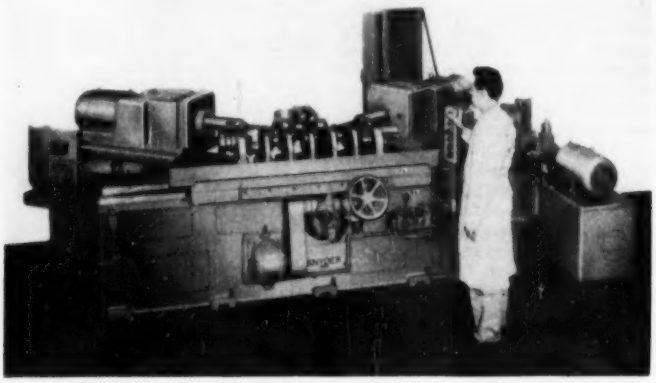
Hydraulic Tube-Bending Press Has Speed of 20 Strokes Per Min

The problem of varying degrees of bend at a particular station of a multiple-index stop is said to have been eliminated in this press. The stop used is said to end unpredictable over-run, such as usually experienced when relying on reversing a four-way hydraulic valve to control the depth of stroke.

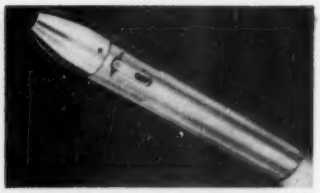
The knee width is 11 in., which permits reverse bends 5½-in. apart. Rocker die and three sets of rockers and side arms are furnished with a hydraulic pressure pad. Also featured is the overhanging ram which operates in nickel cast-iron gibs and permits bending over the top of the punch. It is said that with this construction, all operational strains are taken off the cylinder packings and rings.

The Gibbons Machine Co., Tipp City, Ohio

(MORE DATA? CIRCLE FYI 45, p. 195)



SPECIAL DRILLER for putting lightening holes in large tractor crankshafts. After the workpiece is located in the fixture, it is clamped in place by means of a manually controlled hydraulic mechanism. It is then indexed through six stations at each of which two 1½-in. holes are drilled in the cheeks.— *Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit, Mich.* (MORE DATA? CIRCLE FYI 46, p. 195)



Air-Gage Plug Checks Rough-Surface Bores

A contact-gaging plug for Pratt & Whitney Air-O-Limit internal comparators permits air gaging of rough-surface bores with what is claimed to be a high degree of accuracy. The rate of air flowing through the plug is controlled by carbide buttons mounted on spring leaves. The buttons are depressed by contact with the work during gaging, and impede the escape of air from small nozzles within it. The resultant change in line pressure causes the indicator to show the exact variations from basic diameter in decimal terms.

The contact plug is especially suited for diamond-boring and reaming operations where finishes exceed 50 micro in. rms, a degree of roughness which prevents the use of conventional gaging plugs. In this type of gaging, a relatively smooth bore is pre-requisite to accurate readings. The plugs are furnished with either bullet nose or a pilot nose. The buttons may be adjusted for wear.

Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.

(MORE DATA? CIRCLE FYI 47, p. 195)

Ultra Violet Lamps Available In Both Short and Long Wave

Both of these wave lengths, short (2537 Angstrom units) and long (3660 Angstrom units) possess the characteristic of exciting fluorescence in thousands of substances and compositions. Some substances fluoresce under short wave, others only under long wave, and still others to a varying degree under both. SL Series lamps have been designed so that the joint cost of both lamps is considerably less than the cost of one lamp of a year ago.

Stratex Instrument Co. Inc., 1861 Hillhurst Ave., Los Angeles 27, Calif.

(MORE DATA? CIRCLE FYI 48. p. 195)

Your Ideas may be Better

THAN YOU THINK

BURIED in most engineering files are design sketches marked: "Good idea but costs too much to make."

Such an idea may be so obvious that many designers have played with it and laid it aside. Or it may be completely new.

The spherical tank for hot water heaters was an obvious idea. It had appealed to several engineers. As compared to all other geometrical forms, for an equal cubical capacity a spherical tank has the least surface to dissipate heat. Its periphery is easy to insulate. It is stress resistant because when under internal pressure its stresses are equal in all directions. But its fabrication problems were difficult and it was laid aside.

When the engineers and metallurgists of Servel Incorporated began serious work on the problems of the spherical tank they found that Revere already had made extensive studies of it.

The alloy had been carefully selected. Herculoy, strong as mild steel, corrosion resistant as copper, high in fatigue strength, easily weldable, ideal for all such applications.

Economical drawing sequences had been worked out. Annealing procedures were ready for obtaining the right tempers for drawing operations and in the finished product.

Servel engineers improved upon all this, added good design features such as the use of a copper tube as a flue, worked with the Revere Research Department to develop the assembly welding methods, fitted all procedures to their own shop conditions, and the spherical tank was ready for production.

The same kind of profitability may be ready and waiting for you.

Get out those "impractical for our production equipment" sketches of yours. Let the Revere Technical Advisors look at them.

Your ideas may be better than you think.

REVERE

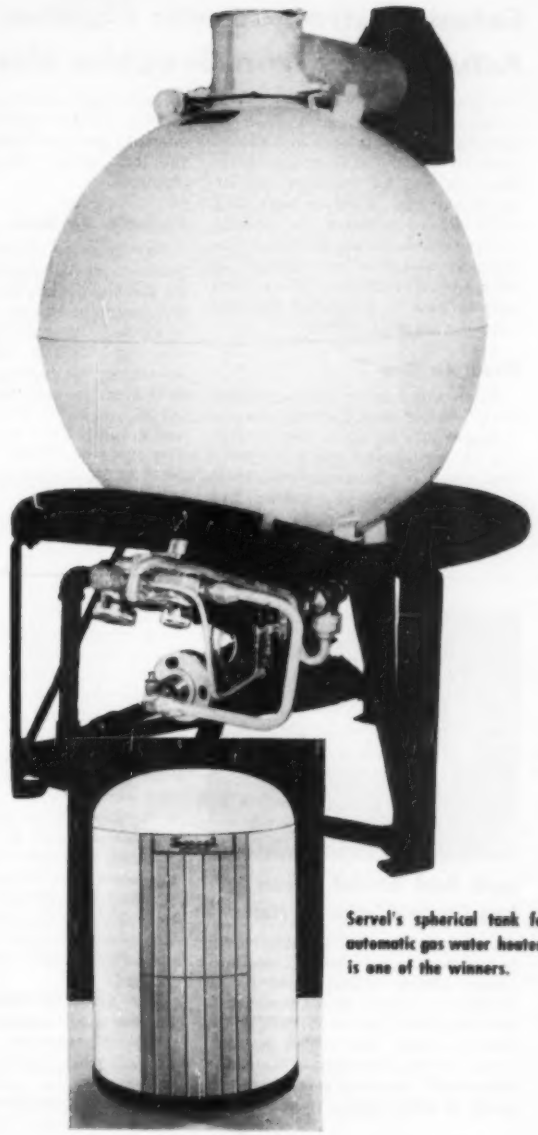
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif., New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.



Servel's spherical tank for automatic gas water heaters is one of the winners.

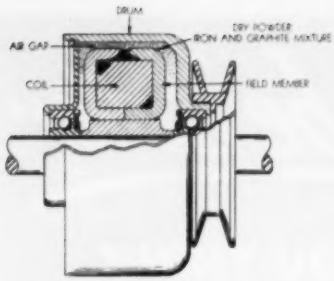


Fig. 1—FIXED AIR-GAP TYPE

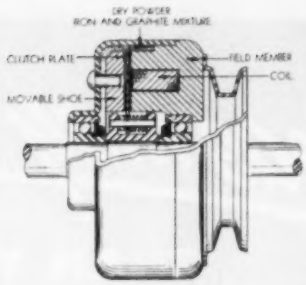


Fig. 2—VARIABLE AIR-GAP TYPE

Eaton Electromagnetic Clutches Actuated by Iron-Graphite Mixture

Dry graphite powder is employed to produce friction without wear in the electromagnetic clutches and brakes made by Eaton. Some of the advantages claimed for this unit are: insignificant wear, freedom from drag, instantaneous response to current, and no serious sealing problems. The company uses two basic designs in their electro-magnetic devices. Common to each is a magnet coil and complete magnetic circuit.

Fixed Air Gap

When the magnet coil is excited, the powdered iron-graphite mixture is drawn into the fixed base separating the drum and electromagnetic field, where it is frozen between these surfaces. This provides a lubricated load-transmitting bond the strength of which depends upon the value of the exciting current applied to the magnet coil. By varying the exciting current, any condition of slip from full lock up to full release can be obtained.

Variable Air Gap

One or more plates are clamped between the field member containing the coil and the shoe which completes the magnetic circuit. When the coil is excited, the shoe is drawn magnetically toward the field, thus squeezing the plates between the field member and the shoe. As this occurs, particles of powdered iron and graphite are trapped on the friction surfaces, thereby automatically refacing them each time the current is applied.

Eaton Mfg. Co., Cleveland 10, Ohio
(MORE DATA? CIRCLE FYI 49, p. 195)

Packaged Hydraulic Fluid Purges System, Suspends Dirt

Hydrauff No. 66 is a non-flammable petroleum liquid designed for hydraulic systems in presses, lift trucks, fixture cylinders, and clamping mechanisms. The fluid is claimed to hold pressure well and to have high efficiency.

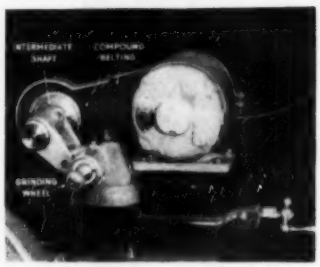
Purging action is similar to that of gasoline and oil additives, where the liquid picks up foreign materials already in the system and carries them in suspension, preventing sludge formation at valves and other fittings.

Flammability tests indicate that steel at 1800F dropped in the fluid will not ignite it, and the fluid will quench a burning, oil-soaked rag.

Tests with a concrete-block-making machine indicate a high film strength and good cleaning power. In a test by a press manufacturer, a 12-gpm gear pump was run for 25 hours, 12 under high pressure, with no appreciable wear showing in the pump.

The formula includes an anti-foam agent to prevent bubbling.

Campbell Oil Co., Cleveland, O.
(MORE DATA? CIRCLE FYI 51, p. 195)



South Bend Internal Grinder Uses Constant-Speed AC Motor

This internal-grinding attachment is powered by a standard, constant-speed, 1/6-hp, 3450-rpm, ac motor which is claimed to be far superior to the universal-type ac-dc motors ordinarily used. The motor is compound belted, through an intermediate shaft, to obtain a quill spindle speed of 30,000 rpm. Tests are said to indicate that less than 1000-rpm drop in spindle speed occurs when taking cuts as heavy as 0.003 in. on a side in hardened steel. It is also said that power loss is negligible.

Four arbors are supplied, the longest permitting a hole 3⅞-in. deep to be ground when using a 1-in. wheel. Four grinding wheels for these arbors with ¼-in. face; ¼-in. bore, and ⅝-in., ¾-in., ⅞-in. and 1-in. diameters are included. In addition, a ⅛-in. chuck is supplied so that the various sizes and shapes of mounted grinding wheels may be used and holes down to ⅛ in. may be ground. Any wheel having a ¼-in. arbor hole and mounted on a ⅛-in. shaft, may be used.

The grinding wheel and intermediate shaft spindles run on high-speed ball bearings.

South Bend Lathe Works, South Bend 22, Ind.
(MORE DATA? CIRCLE FYI 50, p. 195)

May-Fran Conveyor Removes Chips From Production Machine Tools

Designated as Chip Tote, these conveyors will handle hot, heavy, and wet or dry chips and turnings. Different models will be made available to meet height and width requirements of all machine tools.

The chips are funneled into the conveyor belt by means of a steel hopper, carried horizontally until clear of the machine's operating mechanism, and then transported up an incline for discharge into tote boxes. The speed of operation can be synchronized with the metal-removing capacity of the machine with which it is being used.

May-Fran Engineering, Inc., 1677 Clarkstone Road, Cleveland 12, Ohio
(MORE DATA? CIRCLE FYI 52, p. 195)

FYI

FOR YOUR INFORMATION

FREE details about new machines & tools
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FREE shop calculators and data sheets
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FYI—these initials symbolize information that's important. We use them, too, to head our expanded reader service. Here are two postcards which will bring you new literature, bulletins on new equipment, materials or parts, further information from any advertiser, or advice from editors—for a 3-cent stamp.

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NEW BULLETINS

MACHINES AND ATTACHMENTS

1 SHARPENING MILLING CUTTERS—*The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.* 16-page booklet M-1714, "Recommendations for Sharpening Carbide Milling Cutters," covers such topics as equipment required, rules for sharpening, cutter elements, and diamond wheels.

2 AUTOMATIC LATHE—*Sundstrand Machine Tool Co., Rockford, Ill.* 8-page folder illustrates and describes the company's model 8A. Includes specifications and a large drawing showing construction.

3 PRESSES—*Columbia Machinery and Engineering Corp., Hamilton, Ohio.* 8-page bulletin 1000 describes a line of single-crank inclinable and gap presses. Shows two basic designs which make up the line, and a new clutch used in the larger models.

4 COMPACTING PRESSES—*The Baldwin Locomotive Works, Philadelphia 42, Pa.* 4-page bulletin 323 covers compacting presses of 75- and 200-ton capacity for plastics, ceramics, and powder metal. Gives features, specifications, and illustrations.

5 MACHINE TOOLS—*The National Acme Co., Cleveland 5, Ohio.* 16-page bulletin NA-1 describes the company's products and services. Tells which bulletins to send for to get more detailed information.

TOOLS AND ACCESSORIES

6 OPTICAL-COMPARATOR GLASS—*Engineers' Specialties Div., The Universal Engraving & Colorplate Co., Inc., Buffalo 9, N. Y.* 44-page catalog gives details on glass, custom-made charts, standard charts, scales & rules, and staging fixtures and accessories for optical comparators and measuring projectors.

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FREE details about new machines & tools
FREE data on new materials or parts
FREE shop calculators and data sheets
FREE information from advertisers
FREE advice on metalworking problems

7 PRESSWORK FEED—*Great Western Tools, Inc., Burbank Calif.* 6-page folder gives the features of an automatic air-operated feed for strip.

8 DRILLHEADS—*Thriftmaster Products Corp., 1016 N. Plum St., Lancaster, Pa.* 4-page folder on 33 types of drillheads. Includes specifications and drilling data.

9 DRILL CHUCK—*Hauser Machine Tool Corp., Manhasset, N. Y.* 4-page folder on the Leo Hjort keyless self-centering drill chuck.

10 MOTOR LUBRICATION—*U. S. Electrical Motors, Inc., Los Angeles 54, Calif.* 4-page bulletin 1579 presents studies in the lubrication of bearings for electric motors. Shows how company's Lubriflush principle is applied.

HEAT-TREATING AND WELDING

11 ARC WELDING—*The Linde Air Products Co., New York 17, N. Y.* 28-page booklet F-6190 on "How to Weld with Heliarc Torches." Some of the chapters included are—preparations for welding, operating instructions, and complete welding data for various metals.

12 FURNACE — *Surface Combustion Corp., Toledo, Ohio.* 4-page bulletin SC-147 describes and illustrates a rotary-retort controlled-atmosphere furnace for heat-treating.

13 WELDING GUN — *Progressive Welder Sales Co., Detroit 34, Mich.* 4-page folder describes resistance-welding guns made of lightweight castings called Magna-Lyte.

14 FLAME HARDENING—*The Linde Air Products Co., New York 17, N. Y.* 8-page booklet called "New Machines for Flame Hardening" describes their method of operation and their limitations.

PLANT-SERVICE EQUIPMENT

15 MONORAIL SYSTEM — *Whiting Corp., Harvey, Ill.* 20-page catalog on Trambeam, a light crane and monorail system designed for low-cost handling of loads up to 10 tons.

16 TOOL-CRIB CONTROL—*McCaskey Industrial Controls, New York 1, N. Y.* 6-page bulletin A-510 REV shows how the company's method of control works, and describes the index boards, cabinets, cards, etc., used in the system.

17 VIBRATING CONVEYOR—*Robins Conveyors, Div. Hewitt-Robins Inc., Passaic, N. J.* 4-page bulletin 135 describes the Vibra-Veyor, a unit which does not require counterweights.

PARTS AND MATERIALS

18 ALLOY ANNEALING CHART—*Republic Steel Corp., Cleveland, Ohio.* Slide chart gives data for producing spheroidal and lamellar structures in alloys by both conventional and isothermal annealing processes.

19 TINPLATE — *Tin Research Institute, Inc., Columbus 1, Ohio.* 32-page booklet describes the processes used in manufacture, the trade terms used, and gives gage and conversion tables.

20 PACKINGS—*Greene, Tweed & Co., North Wales, Pa.,* 20-page catalog describes Palmetto self-lubricating packings for a large variety of uses. Includes specifications and a selection chart.

21 ALUMINUM PROTECTION — *Pyrene Mfg. Co., Newark 5, N. J.* 8-page booklet describes the Pylumin process of treating aluminum so that paints adhere more readily. The coating itself has anti-corrosion value.

22 SWITCHES — *Westinghouse Electric Corp., Pittsburgh 30, Pa.* 8-page booklet B-4726 describes a complete line of indoor and outdoor air-disconnecting switches.

23 ZINC COATING—*Industrial Metal Protectives, Inc., Dayton, Ohio.* 8-page bulletin deals with Zincilate, a self-protecting, one-coat application that is said to be superior to conventional coatings in anti-corrosion value.

24 ROTARY SWITCHES — *Electro Switch Corp., Weymouth 88, Mass.* 8-page catalog illustrates and describes rotary multi-pole tap and transfer switches that conform to Navy and UL stds.

25 PRECISION CASTINGS—*Michigan Steel Casting Co., Detroit 7, Mich.* 20-page brochure describes the process used to produce these castings. 2-page section covers their engineering properties.

26 PRESSURE GAGE—*Hagan Corp., Hagan Bldg., Pittsburgh 30, Pa.* 4-page bulletin deals with the differential-pressure transformer used to measure pressure and flow differentials.

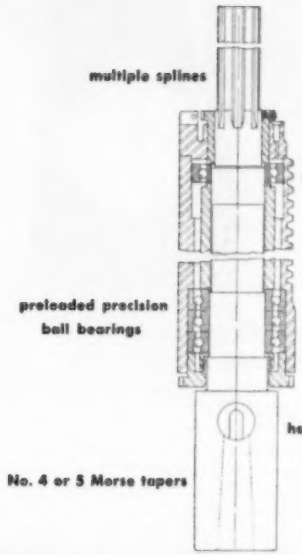
27 REDUCER COMBINATION — *The Falk Corp., Milwaukee 5, Wis.* 16-page bulletin illustrates and describes a unit which combines a speed reducer called the Motoreducer and a right-angle head. Includes selection tables and order guide.

28 POWER BRUSHES—*Osborn Mfg. Co., Cleveland, Ohio.* 4-page bulletin describes a line of Heli-master brushes for cleaning, scrubbing, and finishing.

29 MOTOR-GENERATOR SET—*General Electric Co., Schenectady 5, N. Y.* 8-page booklet covers sets from 30 to 8000 kw as a source of dc power. Shows typical installations.

30 OILS—*E. F. Houghton & Co., Philadelphia, Pa.* 4-page folder deals with high-temperature oils in the following types: straight mineral oils, semi-synthetic lubes, and colloidal graphite in light, volatile oil.

ACCURATE

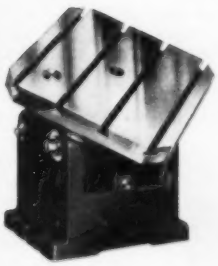


Tough job after job, Cincinnati Gilbert spindles stay right on the button. The heavy 4¼" OD alloy steel quill has a 12-inch long bearing in the head; and the spindle is mounted in the quill with three ABEC No. 5 precision, preloaded angular contact ball bearings at the bottom and one bearing at the top. Hence the Gilbert spindle gives you maximum accuracy even under the strain caused by improperly sharpened drills, uneven depths of cut, as well as normal thrust load of feeding . . . For sustained accuracy, make your next radial a Cincinnati Gilbert. Write for Bulletin 349.

With just one quick set up on this Gilbert Universal Table the operator completes 35 operations on this casting. Productivity is up. Costs are down.

FLEXIBLE

Get better work and more of it with your radials and boring mills. With the Cincinnati Gilbert Universal Table, just one set up enables you to drill, tap, etc. on five sides of the work up to 90°. Four-point support in horizontal position assures maximum rigidity, no strain on worm. Ball-bearing mounted worm and reduction gearing make table movement easy, quick and accurate. Write for Bulletin 850.



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MACHINE TOOL COMPANY
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RADIALS • HORIZONTAL BORING MILLS • ACCESSORIES • THOSE WHO BUY GILBERT, BUY GILBERT AGAIN

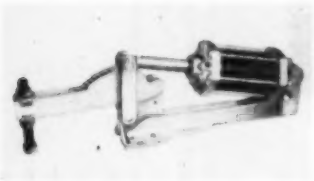
Pease White Printer Prints at Speeds up to 32 fpm

The operator of this whiteprinter is able to select at his discretion either sliding revolving contact or straight revolving contact—whichever is most desirable for the material being reproduced. The adjustment of a lever instantaneously converts from one contact to another.

Another feature is a method for automatically separating tracings or original copy from the sensitized material. Exposed prints are automatically conveyed into the developer while the tracing or original copy is returned to the operator for additional feedings. A tracing return device is provided, which delivers the tracings to the operator in the receiving tray. The drive mechanism is a General Electric thymotrol. The light source is a 75-watt-per-inch Hanovia high-pressure quartz mercury-vapor tube. The starting current is 32 amp, running current 48 amp, and kilowatt load 9.6.

The C. F. Pease Co., 2601 W. Irving Park Rd., Chicago 18, Ill.

(MORE DATA? CIRCLE FYI 59, p. 195)



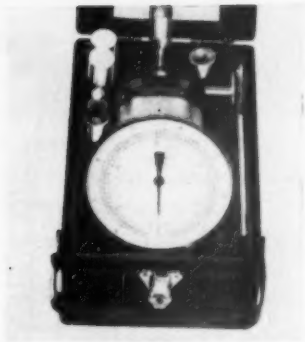
Adjustable Moment Arm Put On Air-Operated Clamps

Two air-operated clamps have been added to the Knu-Vise line by Lapeer. They are known as Models AO-200 and AO-400, the former having a clamping force of 200 lb at the end of the toggle bar, and the latter 1200 lb. The toggle bar in each is in the form of a channel which permits the spindle to be moved along its full length to accommodate the work at hand. With the spindle position close to the base of each clamp, the force is increased to 475 and 2875 lb, respectively.

The models are double-acting and will not release the clamped work in case air pressure accidentally fails. Restricting fittings, which control the speed of the opening and closing of the clamp, also provide a cushioning effect that eliminates hammer action. Maximum air pressure for either clamp is 85 psi.

Lapeer Manufacturing Co., Lapeer, Mich.

(MORE DATA? CIRCLE FYI 60, p. 195)



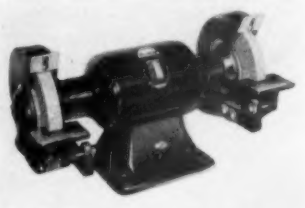
O-Z Tachometers Have Rotating Gear Shifts

The dial of these tachometers have a diameter of 3 in. and a long, open scale, easy to read. The pointer has a knife edge so that one can read between lines. They have a single spindle, with a rotating gear shift. The indicating mechanism is actuated by a double-cross pendulum with links operating the plunger on opposite sides. This is claimed to eliminate side friction.

The damping mechanism consists of a light wind vane which is provided with beryllium bearings to overcome friction. It takes up all shocks and vibrations and imparts a steady movement to the pointer. Made in three range combinations for speeds from 30 to 48,000 rpm.

O. Zernickow Co., 13 Park Row, New York 7, N.Y.

(MORE DATA? CIRCLE FYI 61, p. 195)



Cummins Bench Grinders Produced in Four Sizes to 3/4 Hp

Four grinders produced by Cummins are respectively: Model 470, 6-in. grinder, close coupled, ¼-hp motor—Model 471, 6-in. grinder, long end bell, ¼-hp motor—Model 475, 6-in. grinder, long end bell, 1/3-hp motor—Model 478, 8-in. grinder, long end bell, ¾-hp motor.

Cummins Portable Tools, Div. Cummins Business Machines Corp., 4740 Ravenswood Ave., Chicago 40, Ill.

(MORE DATA? CIRCLE FYI 62, p. 195)

GREATER MACHINE SPEEDS, LONGER TOOL LIFE, LOWER PRODUCTION COSTS

Lusol THE NEW COOLANT

THAT HAS REVOLUTIONIZED PRODUCTION THINKING

10 MILLION GALLONS OF PROOF

The use of 10 million gallons of Lusol solution in exhaustive testing and in everyday plant applications lies behind the extraordinary claims we make for this extraordinary coolant. It has revolutionized the ideas of some of the country's most critical production experts on the subjects of machine speeds, tool life and production costs. These men demanded proof and got it.

SPEEDS INCREASED UP TO 400%

Lusol affords such efficient cooling at the point of tool contact that it has made possible up to 300% to 400% greater speeds, and at the same time less tool wear, less tool breakage, finer finish and greatly increased production. One case, for example, a bar of 18.8 stainless steel was being cut in 20 minutes. Lusol was then used. Speeds were increased from 30 RPM to 267 RPM and the bar was cut in 2 minutes. On this job tools had been breaking frequently. After shifting to Lusol, tool breakage has been reduced to zero. This is just one case, but it is typical of the results that make Lusol hard to compete with.

WHY OPERATORS LIKE LUSOL

Lusol offers the operator many advantages. In the first place it is clear and clean, mild as a soap solution, and not irritating to the skin. Clothes and shoes are kept cleaner and the whole shop takes on a new look. It helps keeps the machine clean, and a good operator appreciates this; and, very important, it is a clear solution that allows the operator to see the work as the finest drill comes down to the work piece. This means more perfect vision at the critical point so often blurred by old type coolants. On top of being pleasanter and easier to work with, Lusol means fewer tool changes, less wheel dressing, far greater speeds, and more efficient production.

SAVINGS YOU CAN'T AFFORD TO MISS

If you are machining, milling, boring, broaching, tapping, drilling or grinding, you cannot afford to disregard the savings that Lusol has made possible for others (perhaps your competitors) whose production involves these operations. Look at these figures "275% greater production per broach grind," "Saved 90% drills, 75% taps," "Over 200% more pieces per wheel dressing." These are facts. They are proof of the type of result Lusol is achieving and can achieve for you.

PROOF THROUGH CASE HISTORIES

BROACHING

266% greater production per broach grind

AMERICAN HORIZONTAL BROACH
Metal: Steel forging
Operation: Broach clutch hub. Broach and work ran hot requiring a *shutdown every 2 hours* for cooling when ordinary cutting oil was used. Changed to Lusol and ran 8 hrs. continuously. Tool and work remained cool.
Ordinary Cutting Oil — 2100 pieces per broach grind.
Lusol — 7700 pieces per broach grind.

TAPPING

Tap life increased 1300%

LEES SPECIAL TAPPER
Metal: No. 1008 Steel.
Operation: Tap ¾" — No. 11 1" through an 11/16" drawn hole at 120 SFPM.
Ordinary Cutting Oil: 30 pieces per tap.
Lusol: 420 pieces per tap.

GRINDING OPERATIONS

Grinding time reduced 25%

LANDIS EXTERNAL GRINDER
Metal: CN Steel.
Operation: Step roll grind to 4 diameters; 1-6" r, 1-9" r, 2 rt. angles removing .015"-.030" of metal.
Ordinary Soluble Oil: Grinding time 8 hours.
Lusol: Grinding time 6 hours.

CASE HISTORIES YOU CAN'T AFFORD TO OVERLOOK

Lusol

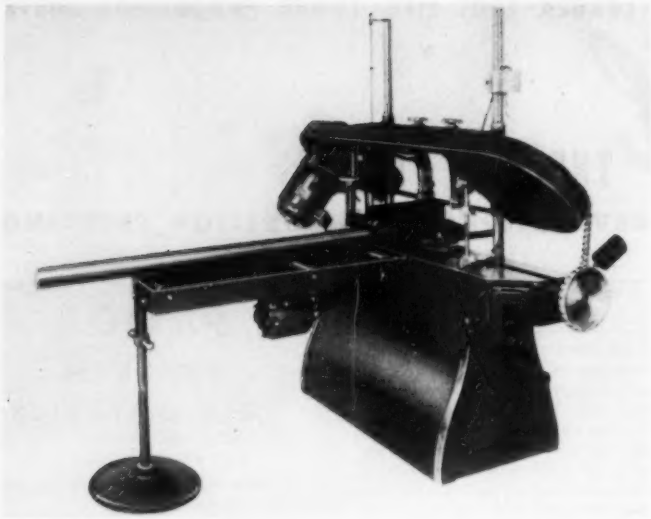
SAVES TOOLS ▼ SPEEDS WORK CUTS COST

NATIONAL DISTRIBUTION . . . WAREHOUSE STOCKS

F. E. ANDERSON OIL COMPANY
222 Brownstone Ave., Portland, Conn.

Please send me your case history material on:
☐ Broaching ☐ Drilling, Tapping ☐ Grinding

Name
Company
Address



Metal-Cutting Bandsaw Utilizes Hydraulic Controls

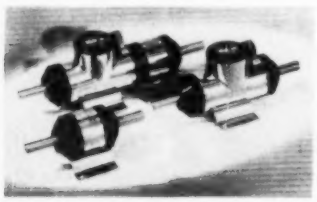
Capacity	14x18 in.
Max. clearance under blade	20 in.
Swivel vise	45° in either direction
Blade length	173x1x0.035 in.
Cutting speeds	60, 90, and 120 fpm

Hydraulic control on this cutter can be set to automatically raise the machine at the completion of a cut and start down again without stopping the blade. Thus, if the operator loosens the vise, feeds stock in against the stock stop, and retightens the vise, the machine will do the rest. When equipped with the automatic vise tightener the operator merely feeds the stock. For completely automatic cutting, the bar feed will do this and thereby eliminate many manual hours.

Some other features include: A rotating blade brush that cleans chips from between the teeth as well as from the sides; blade guides that feature built-in shock absorbers to prolong blade life; a tip-off block for secondary clamping.

W. F. Wells & Sons, Three Rivers, Mich.

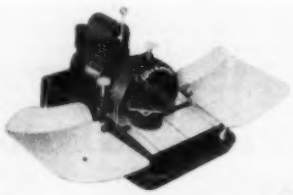
(MORE DATA? CIRCLE FYI 64, p. 195)



MINIATURE DRIVES, one having a variable and the other a fixed ratio, are being combined for low-power applications requiring both speed reduction and variable speed. By combining with a proper fixed ratio, a variable-output speed is obtained at any desired nominal speed, and is infinitely adjustable from 1/6 to 6.

Metron Instrument Co., 432 Lincoln St., Denver 9, Colorado

(MORE DATA? CIRCLE FYI 63, p. 195)



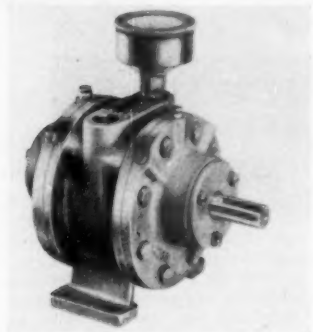
Wickman Bench Grinder Permits Use of Two Wheels

A machine which enables use of silicon-carbide abrasive wheels as well as diamond wheels has been developed by Wickman.

Known as the Model GF-2A, it incorporates many of the basic features of the former GF-2 grinder, such as a 1-hp reversible motor, 12-gph impeller coolant pump, and a swiveling wheel guard. The improvements include a second wheel guard for use with ordinary abrasive wheels, three-position table to provide for wheel wear, a milled protractor slot, and a coolant filter.

Wickman Mfg. Co., 15533 Woodrow Wilson Ave., Detroit 3, Mich.

(MORE DATA? CIRCLE FYI 65, p. 195)



Gast Rotary-Vane Air Motor Has Variable-Speed Drive

The No. 8 air motor is claimed to offer the advantages of variable-speed drive with simple valve control, explosive-proof safety in hazardous locations, and proof against damage when stalled by overloads.

Operating range of this model is from 1/2 hp at 500 rpm to 3 hp at 1500 rpm for the reversible type. Non-reversible models deliver up to 4 hp. For air pressure from 30 to 80 psi, the motor uses from 20 to 100 cfm depending upon rpm and load.

Gast Mfg. Corp., Benton Harbor, Mich.

(MORE DATA? CIRCLE FYI 66, p. 195)

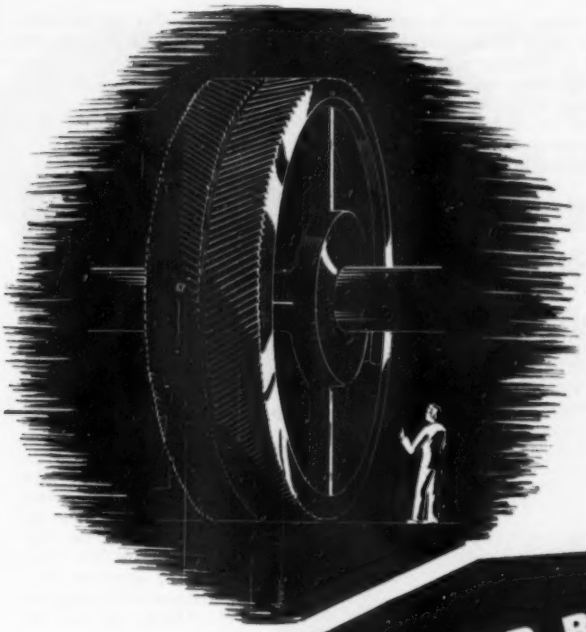
Pre-Wired Panel on Furnace Makes Installation Easy

The panel is available with several sizes of furnaces, and houses the temperature controller, together with a load-carrying relay, thermocouple lead, and fuse-disconnect switch. Electrical wiring of all these parts is complete, it being only necessary for the user to attach the panel to the furnace with screws provided and make two simple connections to the furnace and one to the electric line.

Several recent improvements have also been made in the construction of the furnaces themselves, including more efficient insulation and improved design of the heating elements for faster heating.

Thermo Electric Mfg. Co., 461 W. Locust St., Dubuque, Ia.

(MORE DATA? CIRCLE FYI 67, p. 195)



IS YOUR GEAR DEPARTMENT READY?

to meet competitive production rates?

to meet competitive costs?

AS BIG OR BIGGER AS SMALL OR SMALLER

Michigan's "1950" production gear finishers are designed to produce all ranges of spur and helical gear sizes—external or internal; continuous runs or job lots—more accurately, at lower cost. Here they are:

#861—for gears of ¼″ to 4″ OD
#900—for gears 1″ to 8″ OD
#870—for gears 1″ to 18″ OD
#873—for gears 2¼″ to 24″ OD
#865—for gears 4″ to 48″ OD

PLUS—finishers for gears up to many feet in diameter

Ask for bulletins by machine number.

COMPLETE from blank to finished gear EQUIPMENT

MICHIGAN TOOL COMPANY

7171 E. McNichols Road
Detroit 12, U.S.A.

Valves for Air Cylinders Accurately Control Orifice Flow

A line of Flo-Set speed-control valves feature micrometer graduations for precise control of low-pressure cylinders. They are suitable for air, water, or oil control, with maximum pressure to 250 psi. and maximum temperature to 250 F. They may be mounted in any position.

The face of one end is marked "Controlled Flow Out—Free Flow In" and the other end is marked "Controlled Flow In—Free Flow Out." Controlled flow means that the orifice controlling the flow can be adjusted from zero to full-size opening with one revolution of the adjustment sleeve. Graduations are in hundredths of a revolution, representing 1/100 of the pipe area. Free flow, of course, means unrestricted flow through an orifice equal to the pipe area. Available in three sizes: ¼, ⅜ and ½ in. A fourth valve, the ¼-in. Junior, for use with tubing, does not include the micrometer adjustments.

Hanna Engineering Works, Chicago, Ill.

(MORE DATA? CIRCLE FYI 68, p. 195)

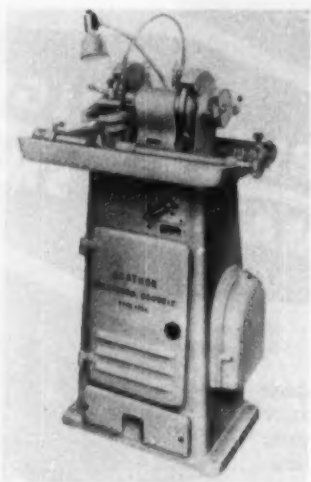
G & H Indexing Fixture Features Rapid Close of Collet

This index fixture has several features which are said to speed production of intricate parts. A control lever easily and rapidly closes the collet. The same lever in conjunction with the index plunger is used to index the fixture when manually operated. A self-seating plunger automatically locks the index plate at the next station. By placing base slots in line with the center of the collets, they are accurately set for work.

Index plates with 24 notches accommodate any multiple of 15°—one index plate can be used to give two, three, four, six, or eight positions per revolution. The addition of an air cylinder sets up the fixture for automatic operation. Collet capacity is from ⅛ to 1 3/16 in. T-bolts for table slots can be provided for the particular machine. Special plates having any desired number of stops at any angle can also be made. Table diameter is 10¼ in.

Barnes Equipment Co., 109 Brookside Ave., Jamaica Plain, Boston, Mass.

(MORE DATA? CIRCLE FYI 69, p. 195)



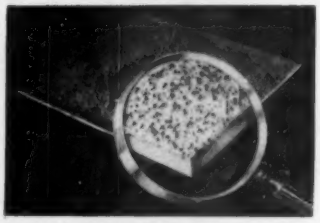
Sliding Toolholder Used on Swiss Grinder and Lapper

Swiss machine is said to eliminate guess work and the checking and rechecking of tool angles. Tool to be ground is held in a compound holder which slides on a bar parallel to the wheel spindle, so that after grinding each surface of the tool, it is only necessary to move the holder to the lapping wheel for the final finishing job.

Tools to a cross-section as small as 1.57x2.36 in. can be handled. Wheels are changed rapidly and easily for HSS. Flexible coolant nozzle allows the operator to direct the coolant to the precise spot desired. Special attachments allow the handling of cutter heads, engraving tools, round boring tools, and other special tools. Chip breakers and curlers can be ground.

Hauser Machine Tool Corp., 30 Park Ave., Manhasset, N.Y.

(MORE DATA? CIRCLE FYI 70, p. 195)



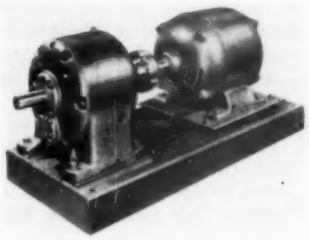
Steel Plus Abrasive Grain Equals Non-Skid Floor Plate

Abrasive grain, of the same type used in grinding wheels, is being rolled as an integral part of the upper section of steel floor plate. The result is a non-skid plate that never loses its grip, since constant wear only serves to expose fresh abrasive.

Known as Algrip, it can be sheared, drilled, countersunk, machined and flame-cut. Flanging is not recommended owing to the abrasive material being non-elastic. A special technique developed by the manufacturer will permit limited forming. The floor plates are manufactured in thicknesses of ⅛ to ⅜ in. inclusive, and in widths up to 60 in. maximum by 144 in. in length. Longer lengths may be special ordered.

Alan Wood Steel Co., Conshocken, Pa.

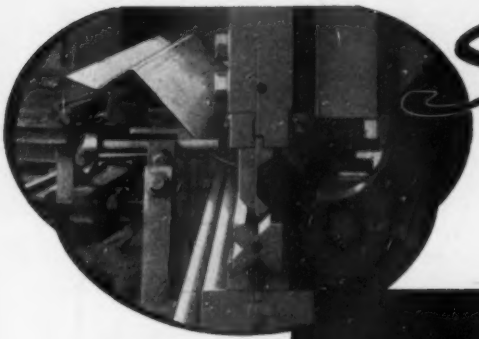
(MORE DATA? CIRCLE FYI 71, p. 195)



HELICAL-GEAR DRIVE with separate standard motor, flexibly coupled and mounted on a welded-steel base plate. A movable plate between the motor feet and the base plate provides for convenient adjustment, should shaft realignment be necessary. Available in double or triple reductions and a wide range of ratios and horsepowers.

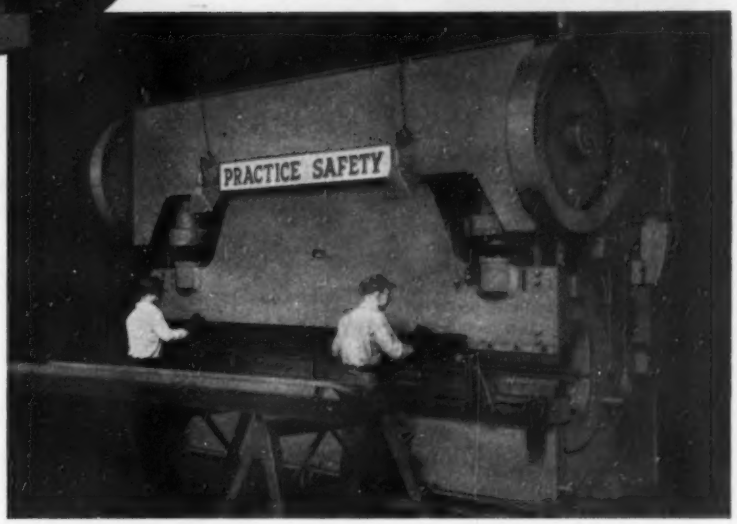
Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.

(MORE DATA? CIRCLE FYI 72, p. 195)



Serves WHITEHEAD & KALES FOR *NEARLY EVERY* FORMING OPERATION

The photographs show the production of parts for car-hauling trailers. Front and back stops make it easy to produce the several bends in each plate accurately and quickly.



This Steelweld handles 12' x 5/8" steel plates between housings and 14' x 1 1/8" over entire length of bed and ram.

For 12 years a Model K5-12 Steelweld Press has been in continuous operation at the Whitehead & Kales Co., River Rouge, Mich., for nearly every type of forming operation in steel plate.

Much of the work is on plate 3/8-inch thick and heavier. Bolt holes and larger holes are frequently punched. Recently oval-shaped holes approximately 5 x 7-inch were punched in 1/4-inch plate. Hundreds of special conduit boxes made of 14 gauge steel have been produced to tolerance limits of .005 inch.

New ways of using the machine are continually developed as problems arise. It has proven to be one of the most generally useful all-around tools to The Whitehead & Kales Co., who specialize in automobile-hauling trailers and other structural work.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1411 East 281st Street, Wickliffe, Ohio

STEELWELD

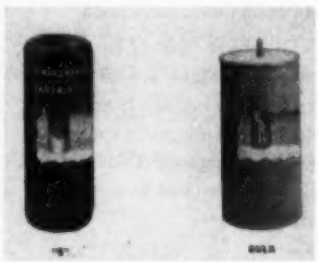
BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

Dings Lifting Magnet Has Lighter Weight

The manufacturer states that this magnet has the following improvements over earlier models: lighter weight, welded construction replacing bolted construction, an insulating compound that dissipates heat more rapidly and provides more protection against short circuits between individual coil wires, four-point chain suspension instead of three, protector guards for the cable, and a balanced magnetic circuit that eliminates flux bottle necks and thereby gives the magnet greater lifting ability. It is available in five sizes, 29-, 39-, 45-, 55-, and 65-in. diameters.

Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee 46, Wis.
(MORE DATA? CIRCLE FYI 73, p. 195)



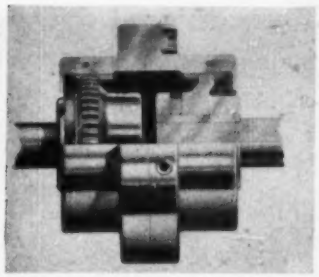
Honan-Crane Cartridge Refills Use Two Oil-Purifying Media

S-type cartridges have been added by Honan-Crane to their line of cartridge refills. Many kinds of oil-purification problems may now be solved.

The purifying media used in the refills are Cranite (processed fuller's earth) and Palconia (blended cellulose fiber). The two materials are available either in bulk or in three interchangeable cartridge refills, Types MC, MF, or the S cartridge.

The S cartridge contains 4½ lb. of Palconia tightly packed in woven-cotton-sock material. Performance is comparable to MF in removal of abrasives, scale, etc. Fiber center tube simplifies disposal of spent cartridge, as the entire unit can be consumed by burning.

Honan-Crane Corp., 701 Indianapolis Ave., Lebanon, Indiana
(MORE DATA? CIRCLE FYI 74, p. 195)



Ajax Spline Coupling Uses Dihedral Shape on Teeth

This flexible coupling is said to be able to handle angular and offset misalignment up to 7° with a standard coupling, and special models for handling up to 12°. The double bevel or dihedral shape of the teeth is said to provide for maximum misalignment with minimum clearance or backlash. At maximum rated misalignment, the driving area spreads over an entire half tooth. All teeth are hardened, and positive oil seals are used.

Ajax Flexible Coupling Co., Inc., Westfield, N.Y.
(MORE DATA? CIRCLE FYI 75, p. 195)

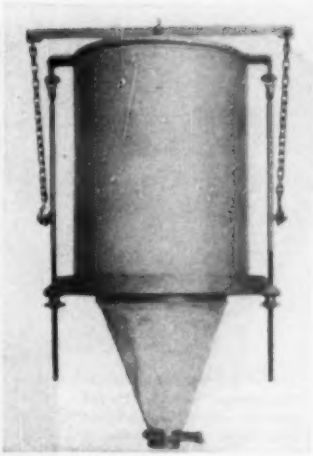
Thoriated-Tungsten Electrodes For DC Inert-Gas-Shielded Welding

Thoriated tungsten is available as a non-consumable electrode for inert-gas-shielded arc-welding. It is claimed to have proven valuable in this dc straight-polarity welding.

The electrodes are said to operate much cooler than standard tungsten electrodes, thus permitting the use of higher currents on a given size. It is also claimed that the new electrodes have good arc stability at both high and low currents.

The process, known as Heliwelding, uses helium as a shielding gas and using dc, is said to provide a harder, more stable, and more efficient arc.

Air Reduction, 60 E. 42nd St., New York 17, N.Y.
(MORE DATA? CIRCLE FYI 76, p. 195)

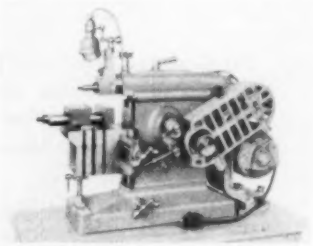


Drum Sling Fills Hoppers Of Molding Presses

Drum sling enables a single workman with a chain hoist to replenish the hoppers of molding and tabletting presses from drums holding up to 300 lb of material. Drums of 16 in. to 24½ in. diameter and 24 to 36 in. in height can be accommodated.

The entire unit is raised by chain hoists to a position over the hopper. Pivot bolts located at the center of gravity enable the unit to be rotated.

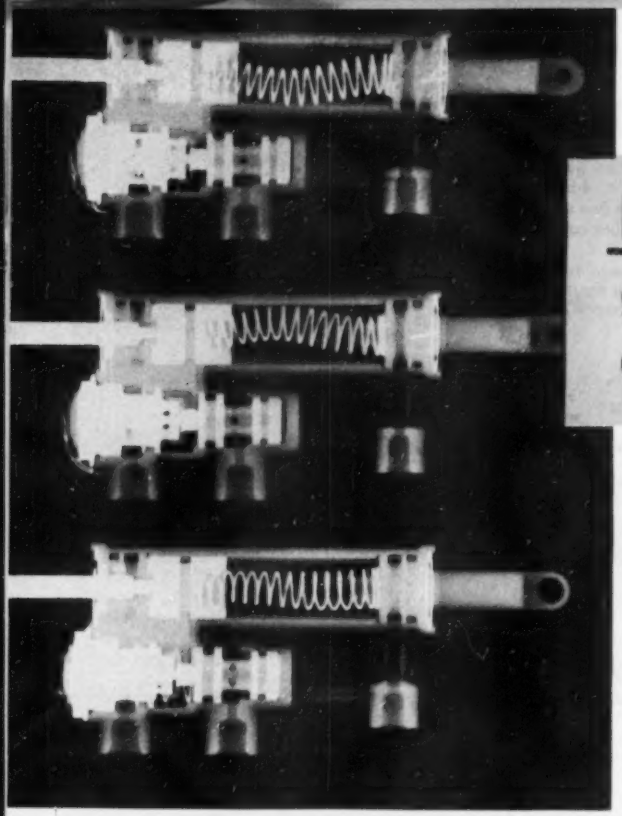
F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia, Pa.
(MORE DATA? CIRCLE FYI 77, p. 195)



Delta Bench Shaper Has Four Stroke Speeds

The Delta 7-in. shaper has four speeds: 40, 70, 115, and 180 strokes per min. The extreme length of stroke is 7¾ in. The table has a horizontal travel of 9½ in. and a vertical travel of 4¼ in. Feed ranges are from 0.003 in. to 0.018 in. The adjustable toolhead is graduated from 0 to 90° for any angle work and has a vertical travel of 3¼ in. The vise has a maximum opening of 4¼ in.

Delta Power Tool Div., Rockwell Mfg. Co., Milwaukee 1, Wis.
(MORE DATA? CIRCLE FYI 78, p. 195)

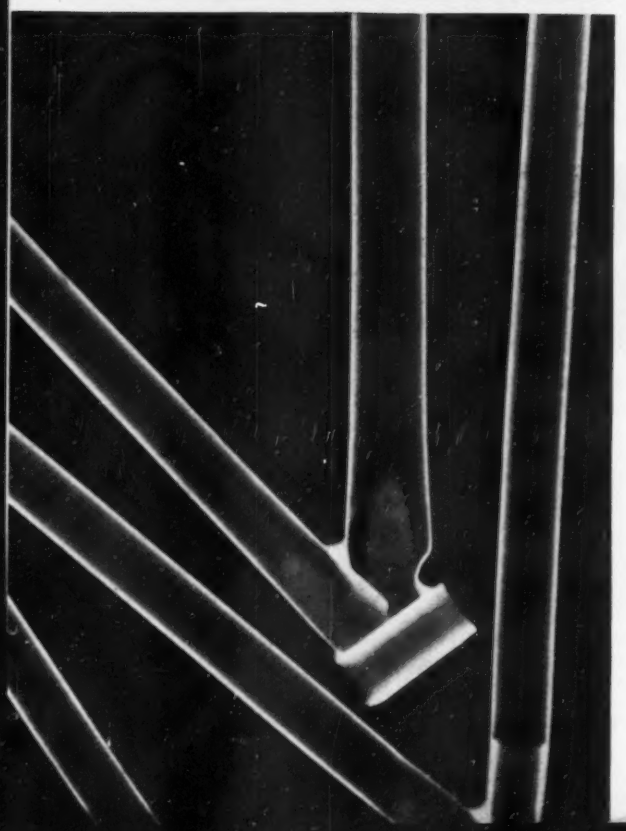


RADIOGRAPHY

goes beyond inspection of castings and welds

CHECKS ASSEMBLIES

Two of a group of hydraulic cylinders failed to function. Disassembly would have taken too long and involved breaking seals. Radiography compared the two with a good cylinder and revealed not only the compression springs rubbing on cylinder walls but also the absence of a second coil spring in the valve assemblies.



EXAMINES ENCLOSED SURFACES

Even though treated and sealed, these landing gear struts of an amphibian plane can develop internal corrosion and become weakened. Radiography alone can provide an examination of these internal surfaces. So the manufacturer has made it routine in the periodic inspection for service and safety of its amphibians.

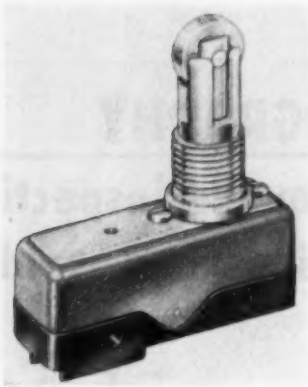
Your x-ray dealer will gladly discuss the many ways radiography can aid your business by increasing foundry yield, checking welds and doing many other important and valuable non-destructive inspections.

EASTMAN KODAK COMPANY
X-Ray Division, Rochester 4, N. Y.

Radiography . . .

another function of photography

Kodak
TRADE-MARK



Roller-Plunger Operates Compact Precision Switch

Designed for machine tools or other apparatus in which electric control is initiated by movement of a cam or dog, the type MXR precision switch is capable of absorbing over-travel up to 7/32 in. A threaded bushing provides for single-hole mounting and permits accurate positioning of the roller plunger in relation to the operating cam or dog.

The roller-plunger Adaptaplate can be furnished with any of the basic Unimax switches: Type MX rated at 15-amp 125-volts, 5-amp 250-volts ac non-inductive; the heavy-duty type SXX rated at 20-amp 115-volts, 15-amp 230-volts, ¾-hp at 125/250/460-volts ac non-inductive; and the universal ac/dc type DMX switch rated at 10-amp 125-volts dc or ac non-inductive.

Unimax Switch Div., The W. L. Maxson Corp., 460 W. 34th St., New York 1, N.Y.

(MORE DATA? CIRCLE FYI 79, p. 195)

Portable Bench Grinder Has 3500-RPM Motor

Known as the Model 400 Hi-Power bench grinder, this unit incorporates features such as: fan-cooled, 110-120 volt, single-phase, 60-cycle, 3500-rpm motor with balanced rotor for smooth running; two adjustable tool rests; on-off toggle switch built into front of motor housing; light-weight, die-cast motor housing with integral wheel guards; and a base with rubber feet. Supplied with two vitrified grinding wheels, 4-in. diameter by ½-in. face (one fine and one coarse), and a 6-ft rubber-covered cord and plug.

Portable Electric Tools Inc., 320 W. 83rd St., Chicago 20, Ill.

(MORE DATA? CIRCLE FYI 80, p. 195)

Cummins 6-In. Polisher Has Five Additional Uses

This cleaner-polisher also does sanding, drilling, portable grinding and wire brushing, bench-grinding and buffing, and rubbing. It will drill up to ¼-in. holes in metal and ½-in. in wood. A swivel side handle may be positioned at any point for greatest convenience. The no-load speed is 1300 rpm.

Cummins Portable Tools, Div. Cummins Business Machines Corp., 4740 Ravenswood Ave., Chicago 40, Ill.

(MORE DATA? CIRCLE FYI 81, p. 195)

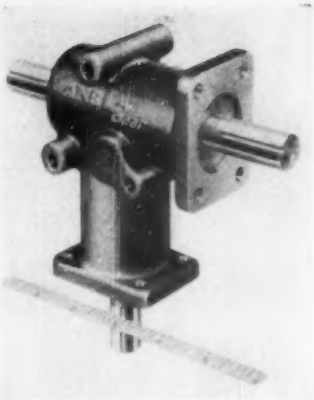
Endless Hacksaw Has Automatic Return Stroke

This hacksaw will do many jobs an ordinary saw cannot do, such as sawing out parts of floor boards, wall panels, metal doors, etc. It is possible to saw in limited spaces because of its unusual design. Return stroke is automatic due to an enclosed spring.

The blade is supported in the front casting by three hardened steel balls. Any standard 10- or 12-in. blade will fit this tool. Price—$3.95.

Ziskind Co., Inc., 49 W. 37th St., New York 18, N.Y.

(MORE DATA? CIRCLE FYI 82, p. 195)



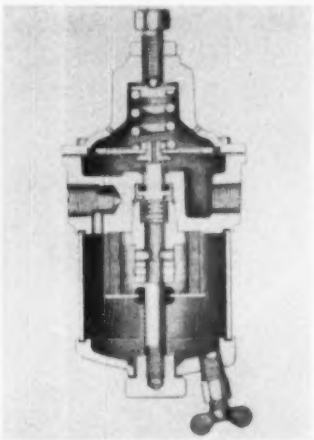
Airborne Right-Angle Drive Rated at 750 In.-Lb Static Torque

Airborne has developed a 1-hp model of the ANGL gear box for either manual or power-operated systems. Shaft diameters are ⅝-in. and special units with shaft extensions can be furnished on order.

Designated as Models R-320 and R-330, they are available in either two-way or three-way units with a standard 1:1 gear ratio and a 2:1 reduction as an optional feature.

Airborne Accessories Corp., 25 Montgomery St., Hillside, N.J.

(MORE DATA? CIRCLE FYI 83, p. 195)



Side-Mounted Drain Cock on Filter Permits Two-Way Mounting

A combination regulator, filter, and dripwell in a single unit is called the Airpak. It is constructed of brass and stainless steel and has a capacity of 25 cfm. A side-mounted drain cock permits horizontal as well as vertical mounting without sacrifice of filter

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"Silver Steel"
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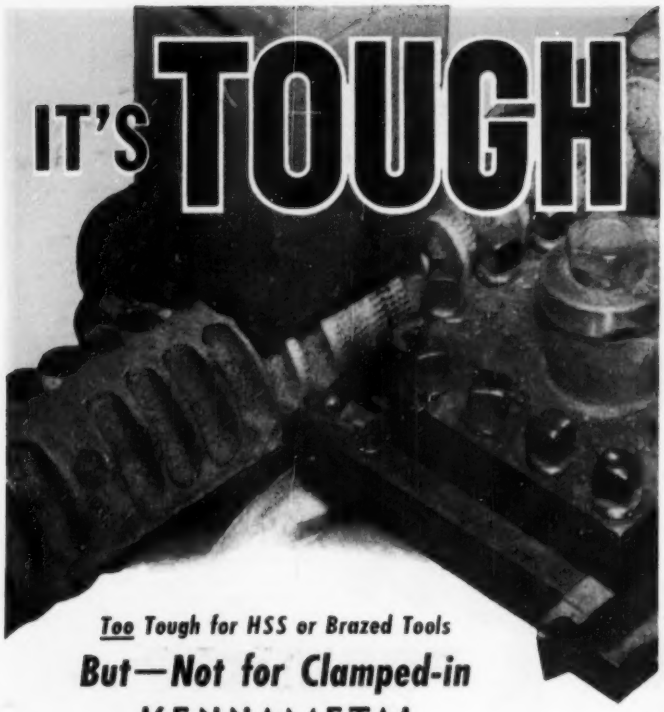
WISH YOU ALL A
Merry Christmas
AND A
Happy New Year!
E. C. ATKINS AND COMPANY
INDIANAPOLIS INDIANA



Too Tough for HSS or Brazed Tools

But—Not for Clamped-in KENNAMETAL

This is a tough job—maybe you'd say, "not suitable for carbide tooling." It's a long, slender cast iron roll having rough, abrasive inclusions, and more interruptions than plane surfaces. The machine and the tool set-up, while adapted to make the best possible use of existing equipment, are far from ideal.

The job was too tough for HSS or brazed carbide tools—*but* not for sturdy Kennametal clamped-in K6. Here's the record: With Kennametal tools machining time is down 62%, production is up 45%, and tool grinding is down 99%. See particulars in table at right.

Your job may not be this tough. But consider this important point—a tool that takes tough jobs in stride is the one to use on routine production jobs where floor-to-floor time, uninterrupted machine operation, and overall cost per piece must be determined with accuracy, and maintained. That's Kennametal. Let us show you, in your shop.

The Facts

	HSS Tools	Kennametal
Feed	.030"	.044"
Cut	⅛"-¼"	⅛"-¼"
RPM	40	80
SFM	39	78.5
Mach. Time	39 min.	15 min.
Prod./8 Hrs.	11	16
Pcs./Grind	Avg. 3	Avg. 350
Pcs./Tool	—	5250 (est.)
Tool Cost	—	$11.45
Tool Cost Pc.	—	$.0022

Are you receiving our technical bulletins on carbide tooling? If not, mail us your request for them . . . no obligation

Write for our latest catalog

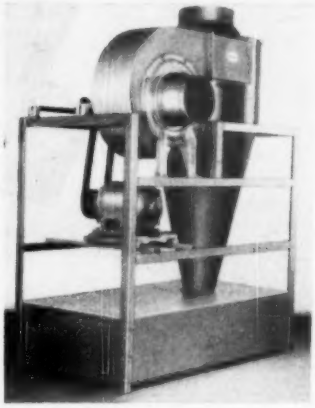
KENNAMETAL Inc.
Latrobe, Pa.
MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

area or of dripwell moisture volume.

The filter medium is phenolic resin—impregnated cellulose capable of removing oil and water, and particles down to 40 microns. Three, ¼-in. N.P.T. taps permit multiple reduced-pressure connections and integral pressure-gage mounting. The unit is available in reduced pressure ranges of 0-25, 0-50, 0-125 psig.

Conoflow Corp., 2100 Arch St., Philadelphia 3, Pa.

(MORE DATA? CIRCLE FYI 84, p. 195)



Dust Collector Available As Standard Unit From Stock

The Model 90N50 Dustkop dust collector is available as a standard, pretested unit, ready for shipment from stock. It is designed for separating dust from the air stream and discharging the cleaned air and toxic fumes out of doors.

It has a capacity of 10,050 cfm—developed by a 15-hp. motor driving a paddle-wheel fan. It has a static suction of 4 in. on a 15 in. inlet. The size of the outlet for discharge of cleaned air is 18-in. diameter.

Aget-Detroit Co., Ann Arbor, Mich.

(MORE DATA? CIRCLE FYI 85, p. 195)

Solenoid-Operated Soldering Tool Especially Adapted for Sweating

The soldering electrodes on this tool are solenoid operated, and controlled by a foot switch. Unit illustrated is of 2500-watt capacity and equipped

DURA-CUT ABRASIVE DISCS

(used on right angle portable grinders and disc sanders)

These new flexible discs are 1/8" thick while the ordinary coated discs have but a single layer of abrasive. Contrasting such a tremendous amount of additional cutting ability it is easy to understand DuraCut's startling advantages.

- **Greater economy.**
- **Longer life — 15 to 20 times.**
- **Faster, sustained rate of cut.**
- **Increased labor savings — less disc changing.**
- **Safe — strong — resist tearing.**
- **Available in a wide range of grits, grades and structures — permit control over rate of cut and finish.**
- **Available in raised hub or flat shapes.**

Ask for a demonstration.

Typical applications . . . Blending and finishing of steel, stainless, alloy steel and aluminum welds . . . Removing rust and scale . . . Finishing sheet metal jobs . . . Auto body work . . . Cleaning weld spatters.

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BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.

Chicago, Cleveland, Detroit, Pittsburgh • Distributors, All Principal Cities.

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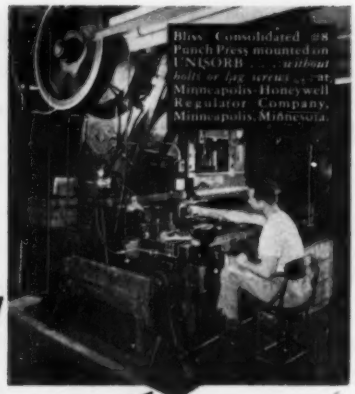
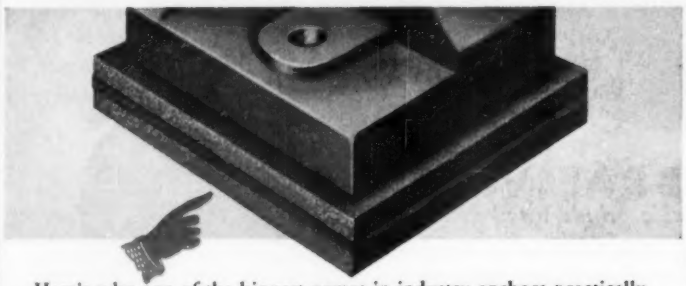
Mounts Machinery
on



UNISORB®

...drilling avoided...floors saved!



Here's why one of the biggest names in industry anchors practically every kind of machine on floors of every construction in the modern way . . . *on UNISORB!*

TRANSMITTED MACHINE NOISE and VIBRATION REDUCED 60% to 85%

Lowers machine and building maintenance costs

Higher speed machine operation often possible

UNISORB ANCHORING REQUIRES NO BOLTS, NO LAG SCREWS

Old-fashioned, destructive floor drilling eliminated

Saves installation time as much as 80%. Labor costs reduced

Maintenance on machine mounting practically eliminated

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Offices: New York, Philadelphia, Chicago, Detroit, Cleveland, St. Louis
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NAME ..... TITLE .....

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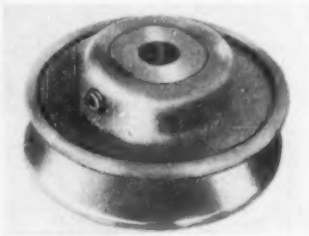
CITY ..... STATE .....

with a selector switch that gives instant temperature control at six different settings to suit the job at hand. It can be furnished with one, six or ten stages of heat control.

Uniform work is said to be attained by use of a clock that gives positive control of the time cycle per connection. The soldering contacts are graphite blocks, that can be shaped to fit the application. Soldering heat is generated from a two-winding transformer that can be used continuously. No shut-downs are required for cooling.

Luma Electric Equipment Co., Toledo, Ohio

(MORE DATA? CIRCLE FYI 86, p. 195)



Bore and Grooves of Pulleys Machined at One Chucking

Climax has developed a line of V-belt pulleys and variable-pitch pulleys manufactured from high-grade cast iron. Their low cost is said to place them in the price range of die-cast or pressed-steel pulleys. Because they have less tendency to accumulate oil or grease from the atmosphere, cast-iron drives are claimed to operate with reduced slippage and lower belt tension.

The bore and grooves are completely machined at one chucking. This is said to assure concentricity between bore and groove and provide a true-running drive.

The Climax Flexible Coupling Co., 863 E. 140th St., Cleveland 10, Ohio

(MORE DATA? CIRCLE FYI 87, p. 195)

Molybdenum Lubricant Put Out in Non-Volatile Forms

Liqui-Moly is a treated compound of the greasy metal, molybdenum, which has the peculiar property of attaching itself by molecular attraction to metal-bearing surfaces, forming a lubricating film that cannot be squeezed out by pressure, and which can withstand extremes of temperature. It has been incorporated into a volatile liquid that evaporates off and allows the molybdenum to plate out on the bearing surfaces, and is now also available in four other

*COLOR

For longer tool life . . . easier cutting . . . finer finishes, use the finest cutting fluids available—use Tycol cutting oils.

Tycol cutting fluids are made to meet every need of industry—from machining aluminum and its alloys to heavy duty broaching.

Each Tycol product is subjected to rigid tests during manufacture. This control assures the required characteristics—*COLOR, flash points, viscosity, to name a few—for maximum performance of that particular product. At every step from selection of crudes to blending of the finished product, Tycol cutting oils are made to provide maximum efficiency which means greater economy, longer life for every type of cutting equipment.

Tide Water Associated will be glad to assist you in selecting the Tycol cutting oil best suited to your specific need. Call or write your nearest Tide Water Associated office for further details.

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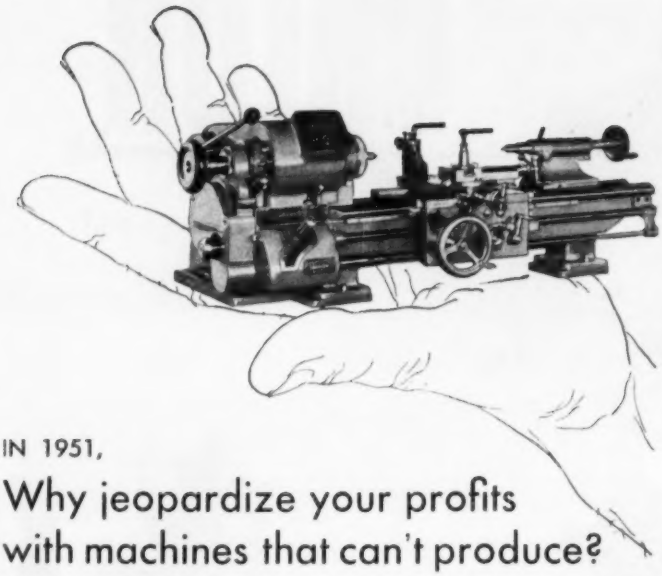
REFINERS AND MARKETERS OF VEEDOL — THE WORLD'S MOST FAMOUS MOTOR OIL



IN 1951,

Why jeopardize your profits with machines that can't produce?

Competition's tough today. And because of the stepped-up costs of labor and materials, there is obviously no room for inefficient machines—if you want to show healthy black figures on your balance sheet.

The time is here for you, and everyone, to look around . . . and see what you can do with better machines, with modern machines.

The Wade No. 8A

TOOLMAKER'S PRECISION LATHE

is just such a machine.

With an 8½" swing, it embodies many desirable features, including

variable speed drive
electric tachometer
foolproof clutch

and, on special order, stepless spindle speeds with ratio as much as 187 to 1.

Our new bulletin, fully describing the "Wade 8A Lathe," will be sent promptly on request.

forms for uses where the circulating cooling effects of a liquid lubricant are required. They are:

Liqui-Moly NV regular and grease —both incorporated in a liquid glycol-derivative having a high viscosity index which will pour as low as minus 25 F.

Liqu-Moly NV thread compound takes advantage of the ability of molybdenum to prevent metals from seizing or freezing together under extreme pressure. Put on pipe threads, it makes the joints tighter with less torque or danger of damage, and the joints acn be disassembled easily.

Moly-Wax-Stix provides a convenient means of applying this molybdenum-base lubricant in solid form. Typical uses are for filling grooves cut in bushings or thrust washers to feed out the lubricant slowly, and to rub on sliding ways.

The Lockrey Co., College Point, N.Y.
(MORE DATA? CIRCLE FYI 88, p. 195)

Mercury Tiering Truck Operated By Single-Cylinder Lift

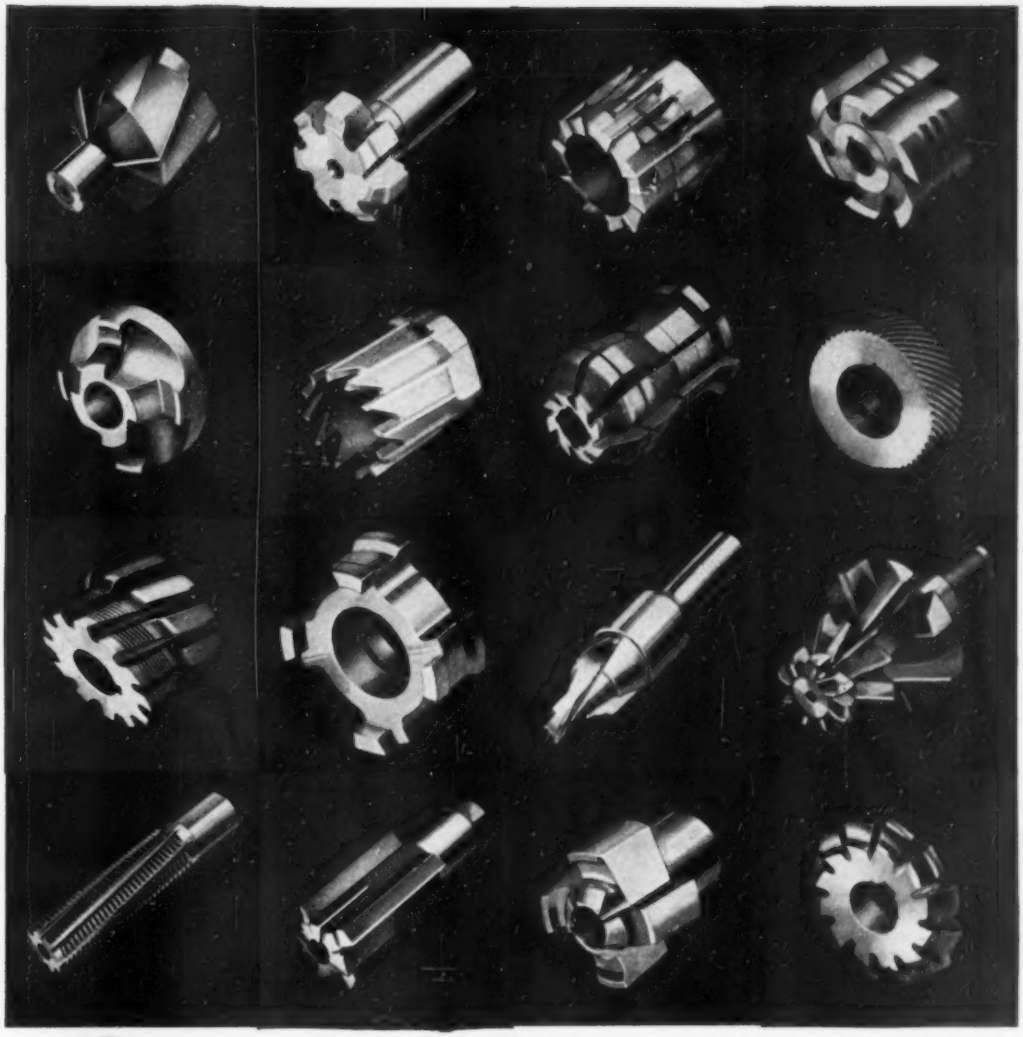
The Model-230 Jeep fork truck features maximum elevation of 130 in. It is activated by a single-cylinder low-pressure hydraulic lift with cross suspension.

The truck has a short turning radius of 60 in. Additional features include cushion tires, shockless center-point steering, magnetic-contractor travel controls, and a power plant with double-reduction gearing.

Mercury Mfg. Co., 5114 S. Halsted St., Chicago 9, Ill.
(MORE DATA? CIRCLE FYI 89, p. 195)

Thickness Setting on X-Ray Gage Can Be Changed in 5 Seconds

Bearing the name Measuray, these gages have dials by which change-over of thickness setting can be made in less than 5 sec., eliminating the need for masters. Other de-



Checkmate RISING COSTS!
...WITH SPECIAL
CUTTING TOOLS FROM
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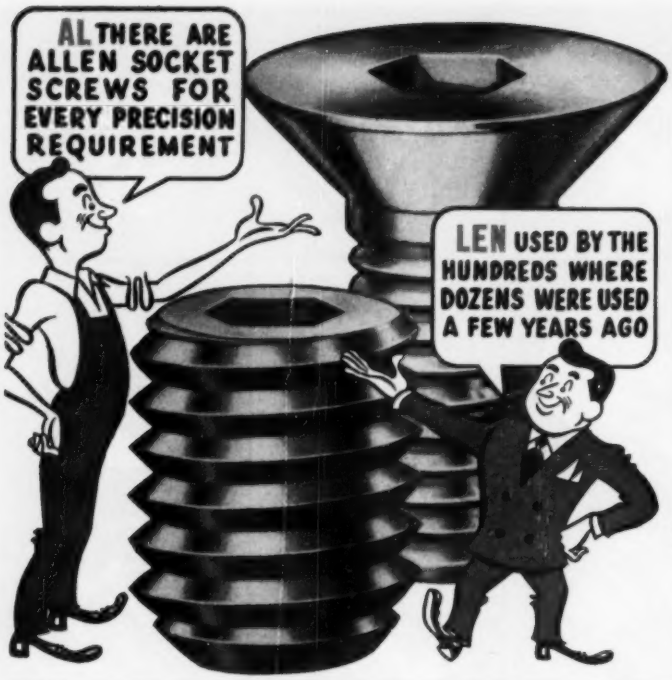
CLEVELAND 2, OHIO
REPRESENTATIVES IN MAJOR INDUSTRIAL CENTERS


AL THERE ARE ALLEN SOCKET SCREWS FOR EVERY PRECISION REQUIREMENT
LEN USED BY THE HUNDREDS WHERE DOZENS WERE USED A FEW YEARS AGO

IF YOUR WORK INVOLVES ONE OF THESE FASTENING PROBLEMS

☐ Vibration	☐ Tighter Gripping	☐ Fast Assembly
☐ Strain	☐ Serviceability	☐ Non-slip Driving
☐ Protrusion	☐ Long Wear	☐ Reduced Weight
☐ Appearance	☐ Precision Fit	☐ Better Balance
☐ Close Spacing	☐ Accessibility	☐ Special Metals & Alloys

Look to ALLEN HEAD SCREWS for the answer

Write us direct for the "Allen Story" on any of the important fastening problems listed above.

HAVE YOU TRIED . . .
ALLEN SQUARE HEAD SET SCREWS

Where socket heads are not required for safety and convenience, Allen offers a high quality, super-strength square head screw in a broad range of standard sizes.

WARNING
Allen-TYPE screws aren't necessarily Allen-MADE. Be sure to get genuine ALLENS. SOLD ONLY THROUGH LEADING DISTRIBUTORS

ALLEN MANUFACTURING CO.
Hartford 2, Connecticut, U.S.A.
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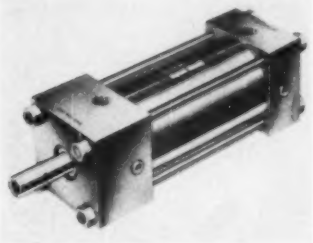
velopments include a small scanning unit containing lower-cost X-ray tube mounted inside its own transformer, a simplified power cabinet with all units easily accessible for quick maintenance, elimination of exterior high-voltage cables, and simplified remote-control stations containing all operating and calibrating controls.

Model No. 50-PF-25 handles plastics as thin as 0.004 and foil of 0.0005 in. thickness. Model No. 50-100 handles cold strip steel as thick as 0.400. Hot steel strip up to 0.420 thick is checked by Model No. 50-HM-100. Three other models are available for intermediate thicknesses.

The Sheffield Corp., Dayton 1, Ohio

(MORE DATA? CIRCLE FYI 90, p. 195)



Compact Pneumatic Cylinders Save on Mounting Space

Despite shorter overall and length dimensions than conventional cylinders, the Modernair Square-Circle cylinder is claimed to provide equal power. Interchangeable mountings are claimed to permit a variety of applications with a single cylinder. Fixed or adjustable cushions are available for either or both end of all cylinder sizes from 2¼ in. up. Bore sizes presently in production are from 1½ in. to 14 in.

Large ports offer no inside restrictions and may be related to each other in 4 different 90° positions. Oilite bearings, solid steel head, noncorrosive brass barrel, combination piston-rod wiper, and self-adjusting front gland are other construction features.

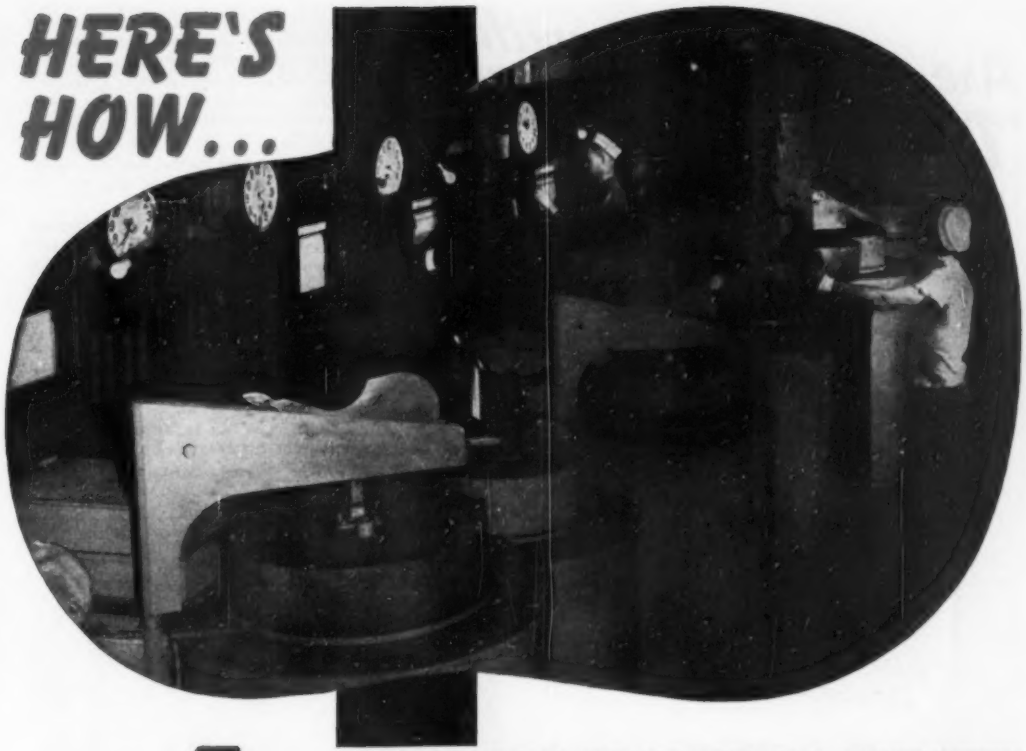
Modernair Corp., 4222 Hollis St., Oakland 8, Calif.

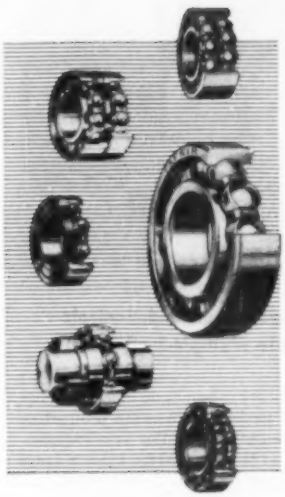
(MORE DATA? CIRCLE FYI 91, p. 195)

Tramrail Electrification System Reduces Arcing of Conductor Bars

A system for three-phase operation with capacities to 600 volts at 75 amp. designed by Ohio Tramrail Systems is reported to reduce arcing and flashing of conductor bars. Large-area shoe contacts with individual

HERE'S HOW...





FAFNIR USES 20 LINDBERG CYCLONES

. . . to draw thousands of types of bearings!

The Fafnir Bearing Company, New Britain, Conn., uses Lindberg Cyclone Furnaces to draw thousands of types and sizes of its line of ball bearings. They say:

"The metallurgical department of our company entrusts the major part of its drawing operations to Lindberg Cyclone Furnaces because it has found them to be dependable work horses. At the present time there are 20 in use in the Company's three ball bearing plants in New Britain, Conn.

"They have given excellent continuous service for more than 8 years. For long periods they were operated 24 hours a day, seven days a week, (at temperatures ranging from 275 to 1200°F.) without downtime due to furnace failure.

"Because the Fafnir line of ball bearings,comprising thousands of types and sizes, is considered the most complete manufactured in this country, the Lindberg Cyclones draw a considerable variety of parts. The work varies from small to large dense loads (up to 1600 lbs.) of bearing rings, balls and rolls, yet the uniform results demanded for the manufacture of precision products is constantly being achieved—and in an atmosphere of cleanliness and satisfactory working conditions."

Local Offices in every industrial center.

LINDBERG ENGINEERING COMPANY 2445 W. Hubbard Street, Chicago 12, Illinois.

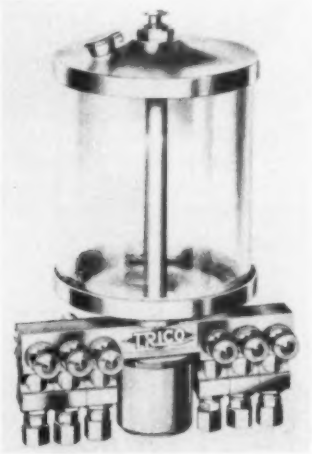
LINDBERG **FURNACES**

springs in each shoe are used. Installed directly below the tramrail track tread, the system is said to offer personnel more protection from electrical hazards. Chance for casual contact is minimized by combining the safer location with a compact 16-gage sheet-metal housing which shields the bars from the top and two sides.

The conductor bars are of copper-bearing mild steel which are claimed to afford double the current-carrying capacity of mild steel with greater resistance to pitting, corrosion, and oxidation. They have a minimum ½-in. air gap from ground contacts. Voltage breakdown above 10,000 volts in tests give adequate protection and safety, for service up to 600 volts. The rail is fabricated in 10-ft lengths for erection on the job.

The Forker Corp., 2024 Random Road, Cleveland 6, Ohio

(MORE DATA? CIRCLE FYI 92, p. 195)



Automatic Solenoid Controls Operate Multiple-Feed Oiler

A centralized system of lubricating 1 to 20 bearing points on machine tools, punch presses, high-speed production equipment and similar applications.

Oil is fed by gravity from a large reservoir through individually adjustable needle valves and through copper or Neoprene tubing to the various bearings. When the solenoid is energized, oil feeds to all lines, and stops feeding when current is shut off. Reservoirs are available in three sizes: one pint, one quart and 2½ quarts.

Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wis.

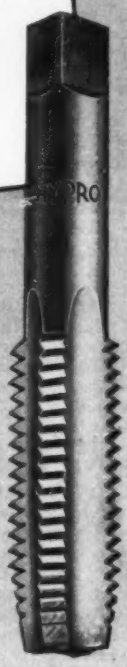
(MORE DATA? CIRCLE FYI 93, p. 195)

Are you troubled with "THREADACHES" in your Tapping Operations?

Here's Your Prescription—

℞ *For immediate relief— apply HY-PRO taps with correct speed, feed and lubrication. Continue treatment for complete cure. More accurately threaded holes will result, and your assembled parts can be fastened tighter, stronger to resist vibration*

ORDER THRU YOUR DISTRIBUTOR



PRESCRIPTION TAPS

From simple ailments to serious breakdowns in tapping operations, HY-PRO Taps are prescribed with every assurance of a complete recovery.

Extremely tough and rugged, HY-PRO Taps maintain their built-in accuracy to provide more accurately threaded holes per tap . . . longer life on the job . . . higher production at less cost.

For every type of Tapping "threadache" there's a sure cure HY-PRO Tap expertly prescribed by specialists in our Engineering Department.

HY-PRO TAPS

COMMERCIAL • PRECISION SPECIAL
Ground Thread Taps

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A., *A Subsidiary of Continental Screw Co.*

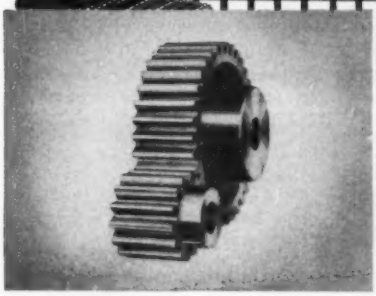
Important Notice to all readers of American Machinist

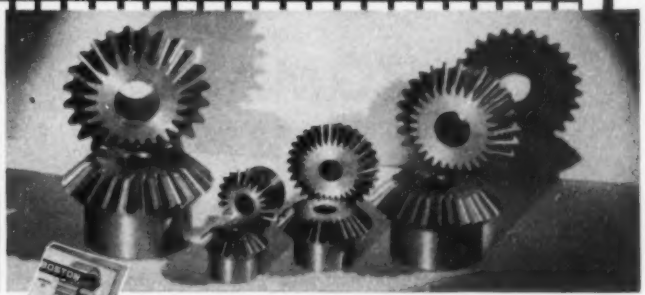
BOSTON GEARS cut 20° Pressure Angle

Quieter — Longer Life

- **TRANSMIT MORE HORSEPOWER**
- **RUN QUIETER** • **LAST LONGER**

ASK THE NEAREST BOSTON GEAR DISTRIBUTOR to show you a pair of Boston Gears cut *20° Pressure Angle.* See for yourself why they are stronger and will take loads otherwise requiring heavier pitch, larger pitch diameter, more expensive, 14½° angle gears. Design them into your equipment.





FOR COMPLETE INFORMATION on Boston Gears write for free copy of Boston Gear Catalog No. 55.

BOSTON SPUR GEARS cut 20° Pressure Angle are *stocked* in 12 – 10 – 8 – 6 and 5 pitch sizes. Consult your new Boston Gear Catalog No. 55.

ALL BOSTON STEEL MITER GEARS are made with a 20° Pressure Angle and with flat (not "cupped") gear end surface for quick, compact, precise assembly and quick, sure alignment when installed. Available from nearby stock. See Catalog No. 55.

BOSTON Gear stocks are Near

BOSTON GEAR WORKS

60 HAYWARD ST., QUINCY 71, MASS.

What is done is DONE... on the GOSS & DeLEEUW

AUTOMATIC CHUCKING MACHINE

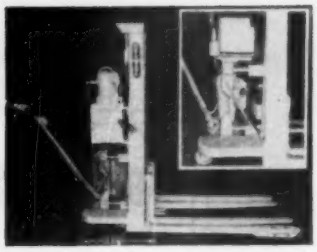
There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS *and* DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.



Pallet- and Skid-Handling Truck Has Shorter Length

This Shortie Model is 10-in. shorter than the preceding types. It is 23 1/2 in. from the front of the truck to the face of the lifting fork. This has been accomplished by mounting the battery above the motor drive unit. The reduced length enables the trucks to stack in narrow aisles.

Two coil springs, one on each side of the motor-drive unit, hold the drive wheel firmly on the floor for max. wheel traction. Swivel casters provide a four point load support.

The Moto-Truc Co., Cleveland, Ohio

(MORE DATA? CIRCLE FYI 94, p. 195)

Switchboard instruments—designed for application where long-range readings must be taken. Designated as types AB-16 (ac) and DB-16 (dc) the 8¾-in. instruments employ 250°-scales, 14.2-in. long for legibility. The scale is mounted flush with the front of the case, a protruding cover providing clearance for both scale and pointer.

General Electric, Schenectady 5, N.Y.

(MORE DATA? CIRCLE FYI 95, p. 195)

Small relay, hermetically sealed, measures 1-in. square by 1¾-in. high, exclusive of the terminals. It can be furnished with a second pole on the switch structure. This provides any combination up to DPDT. Sensitivity is approximately 40 mw.

Sigma Instruments, Inc., Boston 21, Mass.

(MORE DATA? CIRCLE FYI 96, p. 195)

Package conveyor for loading trucks has a low-cost channel frame. Caster-wheel or pneumatic-tired mounting is available for easy portability.

George Haiss Mfg. Co. Inc., 141st St., New York 51, N.Y.

(MORE DATA? CIRCLE FYI 97, p. 195)

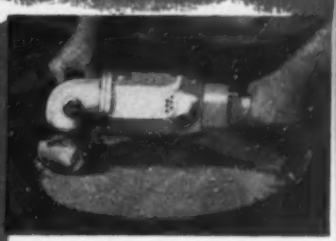
Wire-rope sling employs a Walles splice that is said to add longer life and speed up production. Made without bulky servings, it prevents un-

HERE'S HOW BLACK & DECKER SANDERS speed up Surfacing!

● **GRINDING** . . . With coarse grinding wheels, B&D Sanders swiftly smooth welds and cutting edges, 4x faster, over other grinding in many powered applications.

● **SANDING** . . . *With a wide variety of abrasive discs, B&D Sanders handle all sanding in a jiffy, from fast metal-removal to satin-smooth finishing.*

● **WIRE BRUSHING** . . . *With "Whirlwind" Wire Cup Brushes, B&D Sanders zip off paint, rust, scale; clean castings, tanks, boilers, sheet metal and soldered joints.*



● **WOOD PLANING** . . . *With rotary gouging and planing heads, B&D Sanders quickly shape and semi-finish lumber; remove stencil and brand marks from barrels and boxes.*

These B&D Features Mean Finer Performance, Longer Life!

1 *Full-power B&D universal motor.*

2 *Spiral beveled gears of heat-treated alloy; matched-lapped, spline-mounted for greater strength.*

3 *All vital parts sealed against abrasive dust and dirt.*

4 *All ball bearings on steel inserts and grease-sealed.*

5 *Patented spindle lock for speed and ease of changing accessories.*

BLACK & DECKER ELECTRIC SANDERS are fast, versatile, easy to handle, built to take it! You have your choice of four models—the 7″ Special Sander for intermittent service; the 7″ Standard for general purpose and the 7″ Heavy-Duty and 9″ Heavy-Duty models for more continuous work and greater output.

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EXPANSION REAMERS

Greater Accuracy . . .
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ADJUSTABLE REAMERS • LEFT AND RIGHT HAND SPIRAL REAMERS • STRAIGHT FLUTE REAMERS • CARBIDE FULL-LENGTH FLUTE REAMERS • STUB SCREW MACHINE REAMERS • SHELL REAMERS • JOBBER REAMERS

FREE!
NEW REAMING INSTRUCTION CHART
Determines feed and speeds for cutting steel, ferrous, non-ferrous and non-metallic materials. Write WENDT-SONIS COMPANY, Hannibal, Missouri.

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CARBIDE CUTTING TOOLS
Boring Tools • Centers • Counterbores • Spotfacers • Cut-Off Tools • Drills • End Mills • Fly Cutters • Tool Bits • Milling Cutters • Reamers • Roller Turning Tools • Special Bits

due snagging so that the sling loop can be pulled through restricted openings. The wire ends are buried well within the body of the sling, eliminating the possibility of injury to workmen's hands from sharp protruding barbs.

John A. Roebling's Sons Co., Trenton, N.J.

(MORE DATA? CIRCLE FYI 98, p. 195)

Liquid for dust control, known as Antiseptic Westone, is claimed to not only remove dust from floors, but leave an antiseptic film which inhibits the growth and multiplication of bacteria. Its surface-sealing film is also claimed to hold down subsequent dust for quick and easy removal.

The West Disinfecting Co., 42-16 West St., Long Island City 1, N.Y.

(MORE DATA? CIRCLE FYI 99, p. 195)

Industrial truck has its platform hinged at a line midway of its length. The first half is secured in the usual manner to the truck's elevating mechanism. The other half in lowered position rests upon a forward part of the platform underframe. The two sections are joined by hinges. Capacity is 4000 lb.

Elwell-Parker Electric Co., Cleveland, Ohio

(MORE DATA? CIRCLE FYI 100, p. 195)

Gasoline engine, of 2 hp, is said to be 20 lb lighter than others of similar power. The engine has vertical twin cylinders in light-weight aluminum, and has been designated as Model 360.

Power Products Corp., Grafton, Wis.

(MORE DATA? CIRCLE FYI 101, p. 195)

Liquid nitrogen is being used to pulverize previously hard-to-grind materials. It is sprayed on the material to cool it rapidly to the point of maximum fragility, and thereby reduce the amount of energy required for its fracture.

Linde Air Products Co., 30 E. 42nd St., New York 17, N.Y.

(MORE DATA? CIRCLE FYI 102, p. 195)

Splice caps for pigtail splicing of electrical wires are available in an open-end construction which is claimed to facilitate their installation and inspection. Only two sizes are required for all the most frequently used combinations of two or more wires ranging all the way from two No. 18 to three No. 8. Snap-on insulators of fixed insulating value eliminate necessity for taping of

. . . ask yourself these questions—

1. **Why should we use "fortified" hydraulic oils?**
2. **What oil supplier is the pioneer in such oils?**
3. **What brand is approved by most makers of hydraulic mechanisms?**
4. **What one company supplies both hydraulic oils and hydraulic packings?**
5. **Why should I buy both oils and packings from one source?**

1. For longer, trouble-free service, modern hydraulic oils are being fortified scientifically to (a) increase their resistance to oxidation, (b) hold gums in solution until the oil-change period, (c) prevent corrosion of metal parts, and (d) increase the film strength of the oil. *Results:* better indexing, freedom from chatter, cleaner machines, longer oil life.
2. E. F. Houghton & Co. led the oil industry in its pioneering development of treated hydraulic oils.
3. HYDRO-DRIVE Hydraulic Oils are on the approved list of practically all manufacturers of hydraulic mechanisms.
4. Houghton is the only manufacturer of both hydraulic oils and hydraulic packings—leather and synthetic rubber.
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Those are good reasons why you should specify "Houghton" for hydraulic design or maintenance. For complete data, call or write E. F. Houghton & Co., 303 W. Lehigh Avenue, Philadelphia 33, Pa. Service and sales in all principal cities.

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OTHER HOUGHTON PRODUCTS include industrial lubricants, cutting oils, cleaners, heat treating materials, rust preventives.

SIBLEY

MODEL C-20

DRILLING MACHINE

QUALITY

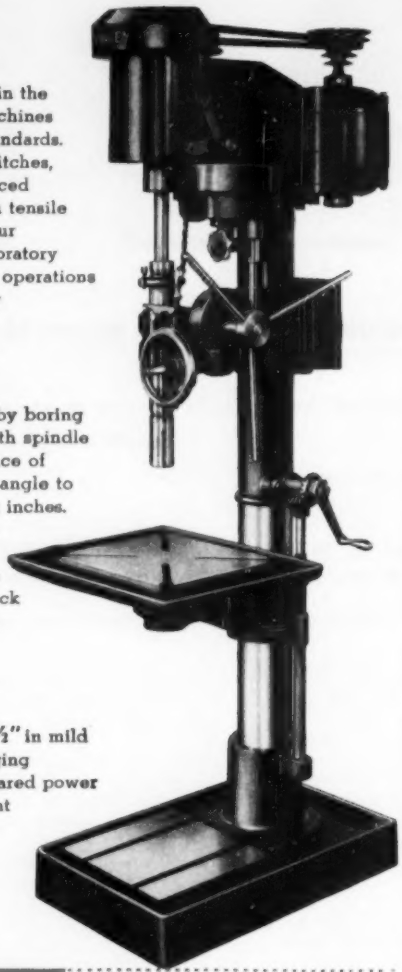
Over 70 years experience in the manufacture of drilling machines provides highest quality standards. All parts except motors, switches, V-belts and bearings produced within our own plants. High tensile strength castings made in our foundry under constant laboratory analysis control. Machining operations and assembly performed by master craftsmen.

ACCURACY

Table alignment is assured by boring table arm after assembly with spindle furnished on machine. Surface of table is maintained at right angle to spindle within .0007" in six inches. Spindle is precision ground and equipped with two ball thrust bearings. Spindle driving sheave and large back gear are each supported by two ball bearings.

FEATURES

20" swing; power to drill 1½" in mild steel; 8 spindle speeds ranging from 65 to 1360 R.P.M.; geared power feeds; simple and convenient controls; automatic spindle stop; rectangular oil groove table; powered by a 2 H.P. motor.



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joints. A hand-operated tool called the Pres-Sure installs the cap.

Buchanan Electrical Products Corp., 1250 Central Ave., Hillside, N.J.
(MORE DATA? CIRCLE FYI 103, p. 195)

Lift Truck, made of aluminum alloy, has wheels that automatically retract when the forks are in a lowered position. The rear wheels are one inch above the floor and thereby enter and leave the pallet without interference or damage to the bottom boards. Operating the lifting handle automatically brings the rear load wheels down to the floor and raises auxiliary wheels.

Market Forge Co., Everett, Mass.
(MORE DATA? CIRCLE FYI 104, p. 195)

Face shields are available with two different types of headgear. One is equipped with overhead brow guard or spark-deflector. The other has an open top for ventilation on hot jobs. The entire unit is said to be sturdily constructed with the headbands formed to fit the contour of the head.

Fendall Co., 4631 N. Western Ave., Chicago 25, Ill.
(MORE DATA? CIRCLE FYI 105, p. 195)

Wheel-conveyor curves have combination stud and hook couplings on both ends. This feature makes it possible to attach the curves for either right- or left-turns regardless of the coupling on the end of the straight section. Available in curves of 45 and 90 deg., they use 16 wheels to the foot.

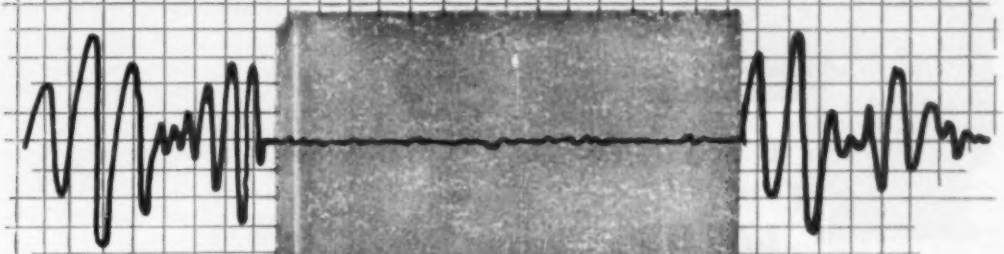
Sage Equipment Co., 30 Essex St., Buffalo 13, N.Y.
(MORE DATA? CIRCLE FYI 106, p. 195)

Overspeed governor changes shutdown speed while running. It is adjustable to decrease or increase the speed. Model GHA comes equipped with automatic reset and GFM with a manual reset. Sealed ball bearings have an extra lubricant reservoir sufficient for life run.

Synchro-Start Products, Inc., 1046 W. Fullerton Ave., Chicago 14, Ill.
(MORE DATA? CIRCLE FYI 107, p. 195)

Pickling inhibitor, designated as "Enthone Inhibitor 8", is claimed to have high inhibiting action in many types of mineral acids including hydrochloric, sulphuric, and phosphoric; lack of odor; complete miscibility with pickling solutions; ease of handling aned economy of use. It can be readily removed by means of alkali cleaners or good running rinses. The amount required

To damp vibration . . .



GUN IRON CASTINGS

IN designing machinery and equipment of all types, it is important to keep vibration at the minimum for maximum accuracy and for longest life of working parts. That is one of the reasons that Gun Iron is often chosen for machine tool castings . . . its dense microstructure has unusual damping effect on vibration. Another important factor is that Gun Iron does not change materially in high heat . . . at 900° F., it grows only ¼ of 1% in linear measurements. It has remarkable impact strength and many other properties superior to those of other irons.

Another important consideration for selecting Gun Iron is the unusual facilities found at Hunt-Spiller for producing large, accurate cast parts. Complete engineering, metallurgical and laboratory facilities are at your disposal to help you in design and operating problems. Complete quality control is assured because Gun Iron is produced in our own air furnaces, cast in our modern foundry and even can be machined in our extensive machining plant.

Whether your cast parts must damp vibration, resist frictional wear, prolonged heats and pressure or just be uniform in chemical and physical properties, it will pay you to investigate Gun Iron. Gun Iron has been doing an outstanding job on the toughest casting assignments for over 139 years.

GUN IRON *in the* METALWORKING INDUSTRY

Hunt-Spiller casts and machines parts for a wide variety of applications in metalworking. A few are shown below:

DIES • MACHINE TOOL CASTINGS • SURFACE PLATES • WEARING PARTS FOR PUMPS, COMPRESSORS, ENGINES, ETC. • H-S THREE PIECE RINGS • PRESSURE CASTINGS

Chances are that there are many other places where Gun Iron can solve a design or operating problem. To help you determine the value of Gun Iron for your cast parts, our metallurgical department has prepared a comprehensive bulletin which contains complete properties and discussions of Gun Iron and many other metals. Engineers claim it an invaluable reference aid. Send for your free copy today.

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FOR HIGH GRADE PRACTICAL GENERAL SERVICE

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Complete regular equipment includes thread indicator.

Guaranteed accurate to good commercial standards. Write TODAY for new bulletin 38-A-8.

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BATAVIA, OHIO

SENTRY ELECTRIC FURNACES

FOR QUALITY HIGH SPEED STEEL HARDENING

Sentry Electric Furnaces produce quality hardening, maximum toughness and exceptional durability in high speed steel and high carbon high chrome. Edges stand up longer which means less frequent grindings, longer tool life and lower tool costs.

Sentry Furnaces utilize Sentry Diamond Blocks permitting full soaking of tools without danger of burning. No scaling. No decarburization. Produce a clean finish which eliminates finishing operations.

Ask for Catalog F20

Sentry Model "5Y" — For hardening larger tools and cutters. Flexible, economical, quick to heat up.

The Sentry Company
FOXBORO, MASS., U.S.A.

is of the order of 0.1 to 0.2% by volume of the acid mixture.

Enthone Inc., Dept. AM, 442 Elm St., New Haven, Conn.

(MORE DATA? CIRCLE FYI 108, p. 195)

Vibration isolator consists of a steel channel floated in rubber between two steel angles. The correct angularity between the steel parts and the rubber securely bonded thereto enables the isolator to approximate the flat spot on a stress-strain curve of relative slope. Because the spring index (load divided by deffection) is not constant, resonance is avoided.

Finn & Co., 2850 Eighth Ave., New York 30, N.Y.

(MORE DATA? CIRCLE FYI 109, p. 195)

Safety goggle, with the name "Saf-I-Duo," has a one-piece plastic lens which is removable and interchangeable. The same lens will fit both the Saf-I-Duo and the Saf-I-Spec, an all-plastic safety spectacle. The lens is made from optilite, a new optical safety plastic which meets government specifications for optical qualities and impact resistance. Available in clear or anti-glare green.

United States Safety Service Co., Kansas City 6, Mo.

(MORE DATA? CIRCLE FYI 110, p. 195)

Hand tachograph has a quintuple selective range and a rotating gear shift. It is made in three different range combinations for speeds of 30-48,000 rpm., 15-24,000 fpm. It is a combination of the company's tachometer with a recording mechanism. Accuracy is claimed to be 0.5% at any point of scales.

O. Zernickow Co., 15 Park Row, New York 7, N.Y.

(MORE DATA? CIRCLE FYI 111, p. 195)

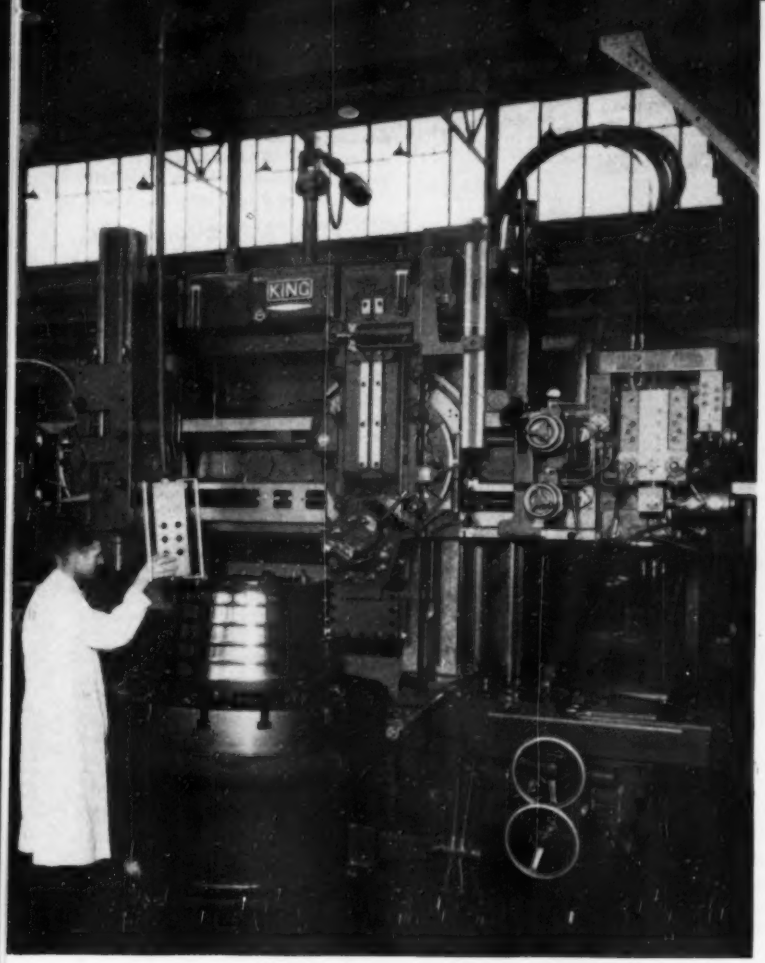
Butterfly disk valves for high-vacuum applications are said to require only a fraction of the space needed for diaphragm or plug valves of equivalent capacity. Opening and closing are effected through a worm gear, thus reducing effort. Standard sizes are 6, 8, 10, and 12 in.

F. J. Stokes Machine Co., 5900 Tabor Road, Philadelphia 20, Pa.

(MORE DATA? CIRCLE FYI 112, p. 195)

Hard-facing alloys in the Eutechrom line of electrodes and gas rods have been expanded and are now available in the following additional types: For water-hardening steel; 6 WH (electrode), 5WH FC (gas). For air-hardening steel; 6AH (electrode), 5 AH FC (gas). For oil-hardening steel: 60H (electrode) 50H FC (gas).

NEW KING WITH CONTOURING ATTACHMENT
Speeds JET ENGINE Production



This 52" KING Boring & Turning Machine was specially built for a large manufacturer of jet engines. Equipped with hydraulically controlled tracer attachment, swivel turret head, and special 4-way tool block on left-hand ram head, this versatile machine combines the following features:

1 — AUTOMATIC CONTOURING

2 — MANUAL ROUGHING WITH AUTOMATIC DEPTH CONTROL

3 — STANDARD BORING MILL FACILITIES

—ALL in ONE machine.

On any type of boring, facing, and turning—on work large or small—this machine sets a new standard in rapid production with dependable accuracy. The basic design and specifications are flexible, can readily be modified to meet individual requirements.

All KING machines, standard and special, are HEAVY, RUGGED, MASSIVE in construction. They have the extra weight and rigidity that assures maximum stock removal at the highest speeds within the range of modern cutting tools.

Tell us your requirements, and we'll tell you how a KING can meet them—with FASTER, MORE ACCURATE, MORE PROFITABLE PRODUCTION.

KING VERTICAL BORING & TURNING MACHINES are made in 10 SIZES — 30" TO 144"

SEND FOR CATALOGS

Illustrated KING Catalogs, with full description and detailed specifications of machines, will be sent promptly on request. Catalog K-1 covers machines sizes 30", 36", and 42"; K-2, sizes 52", 62", and 72"; K-3, sizes 84" and 100"; K-4, sizes 120" and 144".

American Steel Foundries

KING MACHINE TOOL DIVISION

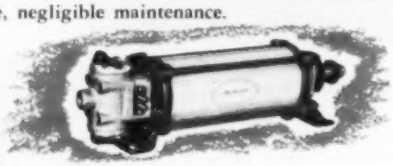
CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

SO COMPACT it can be hidden behind a king size package of cigarettes; so fast even short stroke air cylinders can't match its speed; so safe it can be run submerged, flooded with coolant, or piled with chips; and so sturdily built we guarantee its solenoid-control units against burnout.

That, in a nutshell, describes the Bellows Electro-aire Valve — the electrically-controlled, air powered, air valve. It combines in one complete "packaged" unit a four-way directional valve, piston speed regulators, and low-voltage electrical controls.

You'll find its easy adaptability to the most complex electrically-controlled air circuits simplifies design. Its guaranteed freedom from "Burnout" assures minimum downtime, negligible maintenance.



Write for Your Free Copy of Bulletin AU-250 . . . specifications, wiring diagrams, dimensions of Bellows Electroaire Valves. Address: Dept. AM 1250.

1155

● The ELECTROAIRE VALVE is standard equipment on all Bellows "Controlled-Air-Power" Devices arranged for electrical control. It is adapted for direct connection to or remote control of any air cylinder of suitable capacity.

The Bellows Co.
AKRON, OHIO

For high-speed steel: 6HSS (electrode), 5HSS FC (gas). For hot-working tools, dies: 6HW (electrode), 5HW FC (gas).

Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.
(MORE DATA? CIRCLE FYI 113, p. 195)

Lever control for small electric hoists is said to assure positive, one-hand control. The lever is easily installed and adjusted to the most comfortable position for the operator, regardless of his height, or the distance of the hoist from working space. Made of steel tubing, it is adjustable from 38 to 56 in. in length.

The Horton Bristol Mfg. Co., Bristol, Conn.
(MORE DATA? CIRCLE FYI 114, p. 195)

Portable bar racks are said to have been designed for more efficient handling and storage of steel bundles by one-man operation. They enable the operator to place bundles in racks for storage in tiers, any rack being easily accessible for selection of material desired. Units are of all-steel welded construction, built to any capacity.

Palmer-Shile Co., 16019 Fullerton St., Detroit 27, Mich.
(MORE DATA? CIRCLE FYI 115, p. 195)

Rivet set is made from the company's Mecco Safety Steel that is claimed to prevent spalling, mushrooming and injury to personnel. Two shank designs are available: the patented milled grip; and the standard straight-shank design. They are stocked in five standard sizes for $\frac{1}{8}$- to 9/32-in. rivets.

M. E. Cunningham Co., 95 E. Carson St., Pittsburgh 19, Pa.
(MORE DATA? CIRCLE FYI 116, p. 195)

Safety goggle, made of acetate, is designed expressly to fit women or men with small features. Known as the 800 Panoram, it has replaceable plastic lenses that are claimed to give shadowproof protection and clear, undistorted vision. A lightweight plastic frame conforms closely to forehead and face.

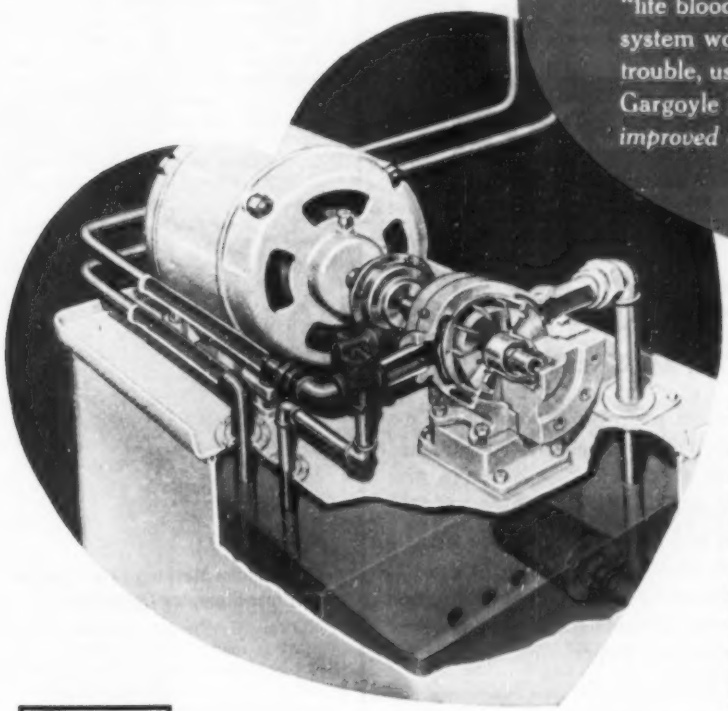
American Optical Co., Southbridge, Mass.
(MORE DATA? CIRCLE FYI 117, p. 195)

Revolving stamp holder makes individual steel letter and figure stamps more readily available. It holds a full set of letter stamps, a full set of figure stamps, and several extra character stamps such as period,

Sure Cure for "Heart" Trouble!

THE WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

"Heart" of many of your production machines is the hydraulic system... oil, the "life blood" that makes this system work. To avoid "heart" trouble, use world-famous Gargoyle DTE Oils—now *improved once again* to...



1. Lower your maintenance costs. DTE Oils resist oxidation, help protect against rust, separate quickly from water. Result . . . greater freedom from deposits, longer life for pumps and valves, fewer shutdowns for cleanings.

2. Increase your production. Because DTE Oils assure more perfect operation of hydraulic mechanisms, your machines run more continuously, produce more.

3. Lower your lubrication costs. Improved chemical stability gives DTE Oils unusual resistance to deterioration, so they last longer, protect better, cost less in the long run.

Get these great new oils for your hydraulic systems *now!*

SOCONY-VACUUM GARGOYLE Lubricants

Socony-Vacuum

Correct Lubrication

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

READY!
AIR CYLINDERS AND VALVES
4-Way Bench Valve
4-Way Cam Valve
4-Way Foot Valve
3-Way Fingertip Valve
3-Way Petcock Valve
3-Way ⅛" Foot Valve
3-Way ½" Foot Valve Self Locking and Spring Return
With a valve to suit the job air cylinders can be made to work wonders. Mead Air Valves, Single and Double Acting Air Cylinders, will help you cut costs, speed up work. Write for complete new Catalog of famous Mead air-operated devices!
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4114 N. KNOX AVE., DEPT. MA-120, CHICAGO 41, ILL.

Investment Casting Requires Good Pattern Tooling

Investment casting is an exact process . . . involving expendable patterns and strict adherence to established metallurgical and founding practice . . . in order to produce uniform and accurate parts.

Operations essential to investment casting are clearly explained by two experts in *American Machinist's* Special Editorial Report, "Investment Castings Depend on Good Pattern Tooling." The authors discuss the latest aspects of pattern tooling from considerable experience, and discuss examples of both good and bad practice.

Filled with instructive photographs, copies of this 12-page report are available at 20¢ each. Write to Reader Service Department:

American Machinist

McGraw-Hill Building **New York 18, N. Y.**

comma, dash, diagonal line, as well as special characters. It carries the individual stamps at an angle so that the stamp needed extends toward the user.

The Acromark Co., 7-13 Morrell St., Elizabeth 4, N.J.

(MORE DATA? CIRCLE FYI 118, p. 195)

Silver-soldering flux, known as AG, is a low-temperature flux that is said to have a powerful scavenging action. It acts on solder to eliminate the time lag between fluidity of the solder and its adherence to the parent metal. By increasing the fluidity it is claimed to reduce porosity. The residue may be removed by washing with hot water.

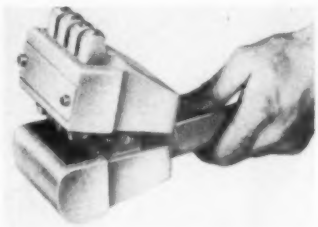
Farrelloy Co., 1217 North 26th St., Philadelphia 21, Pa.

(MORE DATA? CIRCLE FYI 119, p. 195)

Crane, known as the Model UC, is mounted on a Minneapolis Moline Model UTI tractor and has a high-lift capacity of 5 tons. The boom is raised and lowered by means of a hydraulic cylinder that allows safe and accurate control independent of any other operation. The boom rotates 320° and has a length of either 18 or 24 ft. Hydraulic stabilizers on the front end provide additional stability when handling loads over the side.

Clyde Iron Works, Inc., Duluth 1, Minn.

(MORE DATA? CIRCLE FYI 120, p. 195)



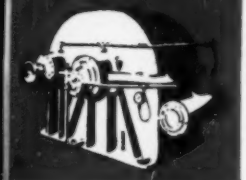
Cunningham Marking Tool Permits Multiple-Stamping Operation

Marking device for stamping steel sheet is made from aluminum and can be manufactured with a holder section for accommodating almost any size or number of characters.

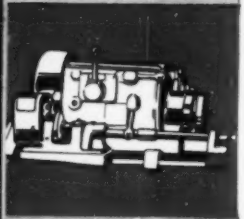
The top swivels upward so the holder can be slipped over the pieces to be marked. When pressure is released springs drop the top into position. The operation is completed by striking each stamp with a hammer. Springs retain the stamps in the holder and permit rapid changing.

M. E. Cunningham Co., 95 E. Carson St., Pittsburgh 19, Pa.

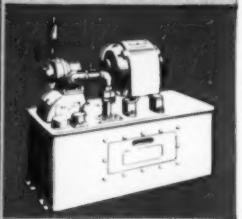
(MORE DATA? CIRCLE FYI 121, p. 195)



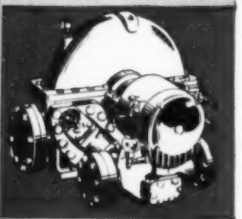
SPEED REDUCER



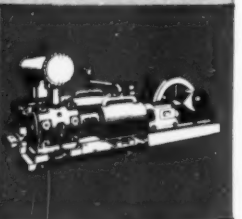
HEAD STOCK GEARS



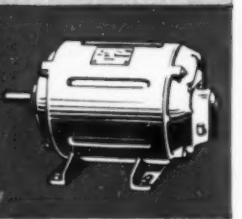
HYDRAULIC SYSTEM



AUXILIARY TURBINE



COMPRESSOR



MOTORS

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STANOIL
TRADE MARK
Industrial Oil

Brings two new benefits to wide range of jobs

For 14 years, STANOIL Industrial Oils have proved their ability to handle a wide variety of jobs in midwest plants. Now, these established products have been made better than ever! They offer these new and important savings in an even wider variety of industrial equipment.

1 LONGER OIL LIFE

Because they have greater oxidation stability, the new STANOILS stand up under high temperatures of operation, maintain low acidity for longer periods of service which helps keep oil systems free from deposits caused by oil oxidation.

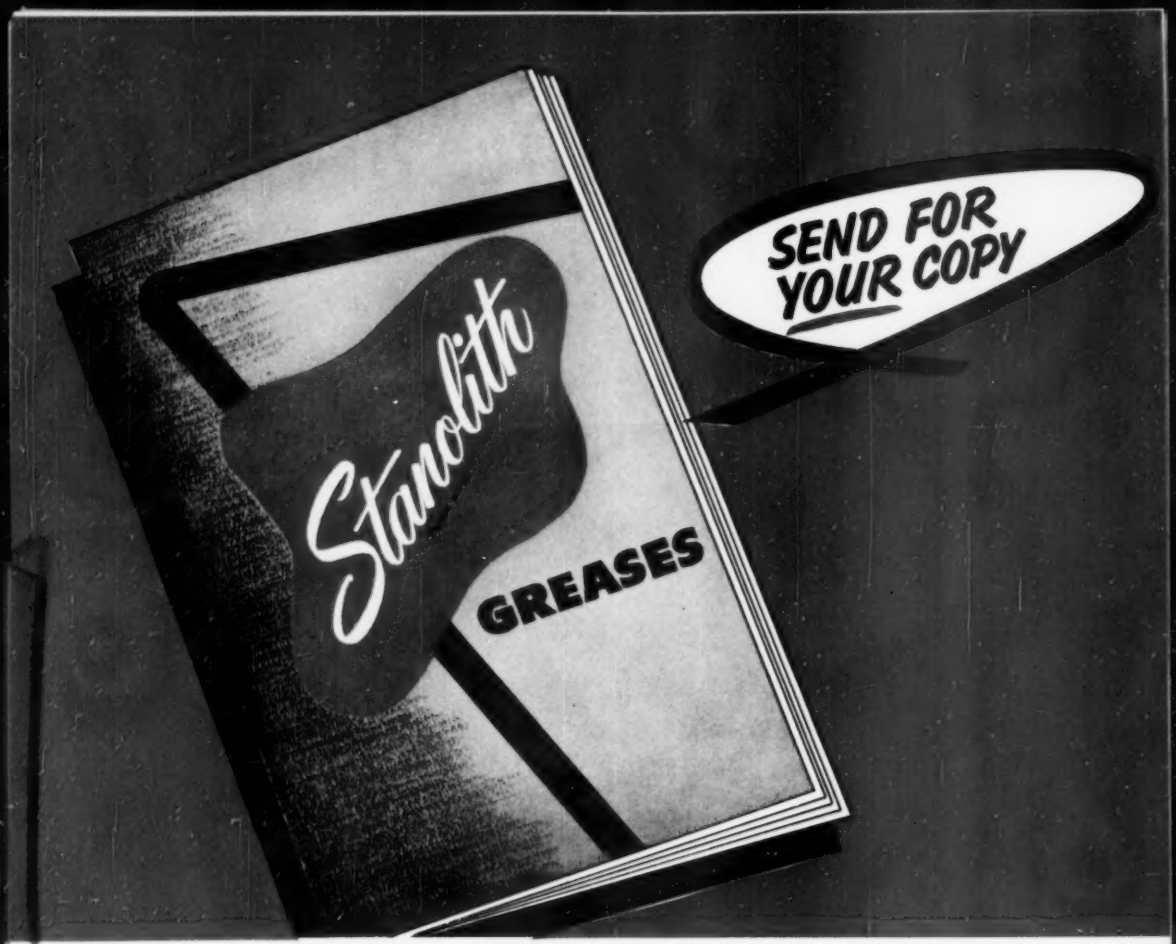
2 GREATER PROTECTION against RUST

A corrosion inhibitor of the most advanced type has been added to all grades of the new STANOILS that benefit by such an additive. This inhibitor prevents corrosion trouble by "plating out" on surfaces that tend to rust. In such severe service as paper-machine and steam-turbine lubrication, new STANOILS have put an end to rust and corrosion troubles.

At the left are shown several types of equipment in which the new STANOILS can save you money and maintenance time. A Standard Oil lubrication specialist will help you find still other applications where versatile STANOILS can replace many special-purpose oils. You can reach this man quickly and easily through your local Standard Oil Company (Indiana) office. Contact him today. Or, if you wish, write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

STANDARD



Here's help for bearings in "HOT WATER"

New booklet tells how STANOLITH Greases solve wet-hot problems

HOW TO LUBRICATE bearings which operate under extremely wet conditions, and at the same time, are subjected to high temperatures? If that is one of your problems, the booklet illustrated above holds the solution.

It tells you about the outstanding qualities of Standard Oil's new STANOLITH Greases. It explains why these lithium soap products—unlike soda soap or lime soap greases—will withstand *both* heat and water. The booklet contains evidence of this ability. It gives actual case histories of some of the many different jobs on which STANOLITH Greases have eliminated troubles caused by high temperatures, presence of steam or water, and high speeds. It also describes successful low-temperature service.

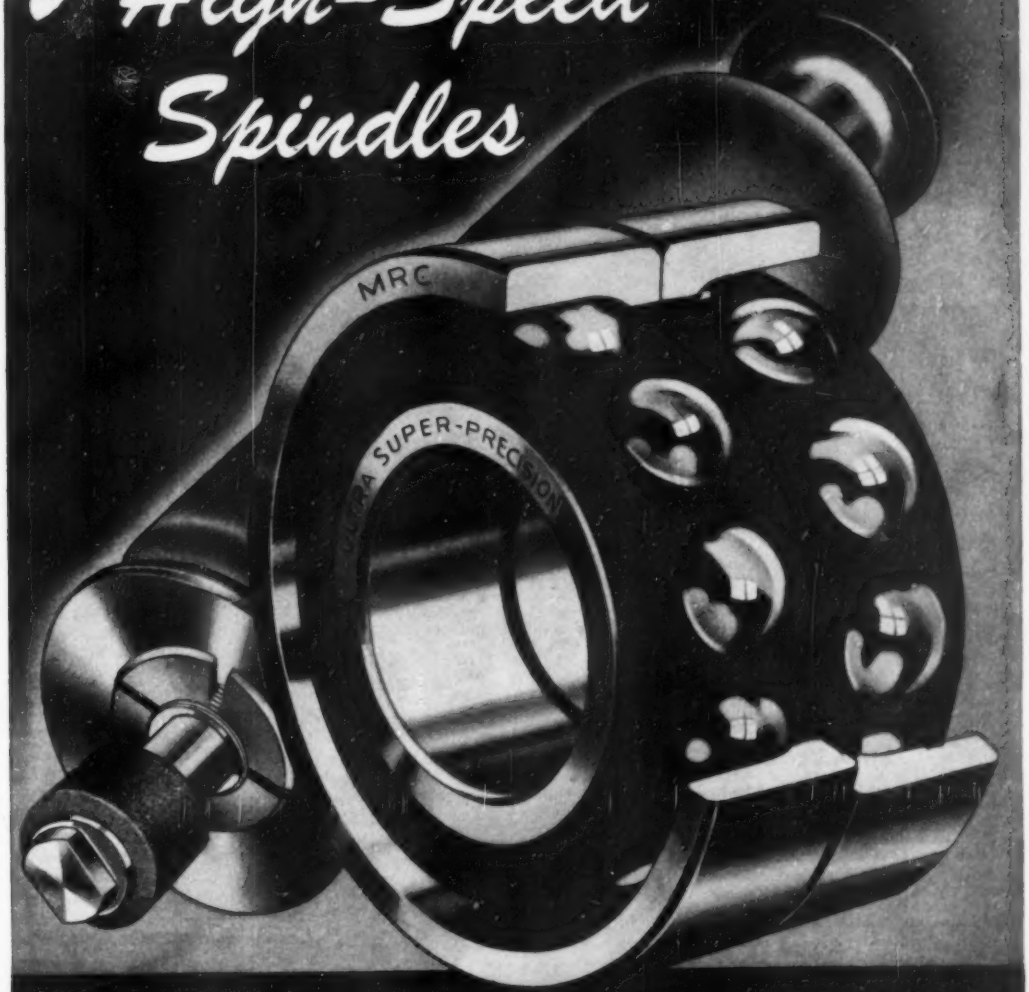
Study this wide range of applications. Discover how the two grades of STANOLITH Grease not only can solve difficult lubrication problems but can save you the cost and trouble of stocking and using a variety of special greases. Send for this information. Write for your copy of the STANOLITH booklet today. Simply address your letter to:

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

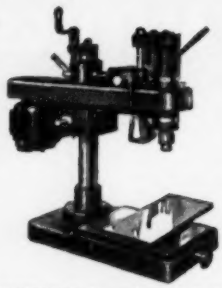
STANDARD OIL COMPANY (INDIANA)

M-R-C ULTRA SUPER-PRECISION BEARINGS

for High-Speed Spindles



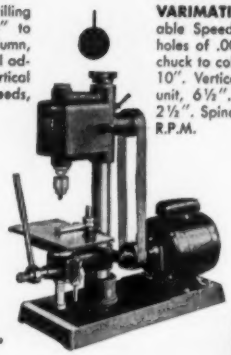
MARLIN-ROCKWELL CORPORATION Jamestown, N.Y.

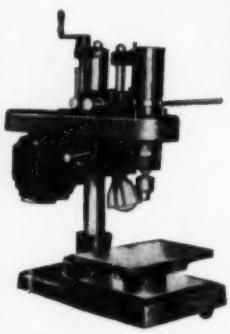


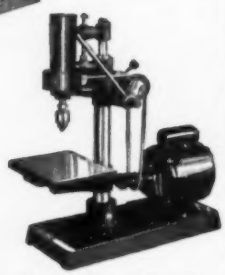
HAMILTON, Super-Sensitive Tapping Machine. Taps from the smallest and finest to 10-32 inclusive. Center of chuck to column, 3¼". Table to chuck, 4". Vertical adjustment of table, 3½". Vertical travel of table, 1¾". Spindle speeds, 1200 to 2600 R.P.M.

MAXIMUS, Super-Sensitive Drilling Machine. Drills holes of .004" to 5/16". Center of chuck to column, 8". Table to chuck, 10". Vertical adjustment of drilling unit, 10". Vertical travel of drill, 3". Spindle speeds, 750 to 8750 R.P.M.

VARIMATIC, Super-Sensitive, Variable Speed Drilling Machine. Drills holes of .004" to 5/16". Center of chuck to column, 5". Table to chuck, 10". Vertical adjustment of drilling unit, 6½". Vertical travel of drill, 2½". Spindle speeds, 840 to 9300 R.P.M.







FOUR DRILLS & A TAPPER

MAXI-JR., Super-Sensitive Drilling Machine. Drills holes of .004" to 5/16". Center of chuck to column, 5". Table to chuck, 8". Vertical adjustment of drilling unit, 8". Vertical travel of drill, 2½". Spindle speeds, 750 to 8750 R.P.M. (Special drive for higher speeds available).

A-M, Super-Sensitive Drilling Machine. Drills holes of .004" to .250". Center of chuck to column, 3¼". Table to chuck, 8". Vertical adjustment of table on column. Vertical travel of drill, 2". Spindle speeds, 788 to 9500 R.P.M.

FOR RAPID CONTINUOUS PRODUCTION OF

SMALL PRECISION HOLES

We believe that the line of Hamilton Super-Sensitive Drilling Machines and the Hamilton Super-Sensitive Tapping Machine are the finest machines made for the work of producing small holes of plus-precision in materials as diverse as paper and monel or ceramic and bronze. And this belief is fostered by present users through letters of praise. An indication of present users' esteem is this; that eighty percent of our present sales are made to previous users.

The data published here is only intended to show sizes and prices. For a complete description of features and advantages, write for free descriptive literature.

NOTE: All prices are domestic, F.O.B. Hamilton, Ohio, and are subject to change without notice.

DON'T FORGET! WRITE FOR FURTHER INFORMATION!

THE Hamilton TOOL COMPANY

833 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

ROUND TABLE Discussion

WHOSE BUSINESS?

IT IS astonishing the tremendous change that takes place in my plant that has gone through a bad time and then receives a larger order! The whole plant, from front office to the not-so-lowly helper, seems revitalized—like a new lease on life.

Any sales engineer who went through the depression and through to good business could see and feel the difference in the welcome he received, when good business took the place of the depression. So I believe that no time should be lost in informing the boys that prospect is bright for continuous, steady work.

A. Silvester
Niantic, Conn.

•

IN MY opinion, Ed is entirely wrong in his assumption that new orders coming into the shop are no concern of the employees.

This attitude may have been all right in the free and easy days when the worker knew that the boss would keep him on when times were slow. At that time the headaches of obtaining sufficient orders to keep going belonged only to the boss, while the employee was able to collect his weekly pay even if the employer had to get less or do without.

Today, however, in the face of keen competition from all sides and the driving need for obtaining orders even at small profit to be enabled to pay for overhead, such concern affects the worker, because it is directly connected to his security.

Contrary to Ed's pessimistic prediction that the workers would seek to gouge a raise if they knew plenty of orders were coming in, the employees would feel better if they knew their jobs would continue with no threat of layoffs. If the worker is kept in the dark or given the impression that work is slackening when such is not the case, he is likely to become depressed over prospects of losing his job, consequently his mind is unsettled and the immediate work suffers. If, however, the worker is apprised when new orders are obtained, he then knows his pay will continue uninterruptedly and he can make further plans to enrich his life for his leisure time, perhaps, as Al suggests, by buying a new television set, or a car,

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol O.C. Turbine Oil

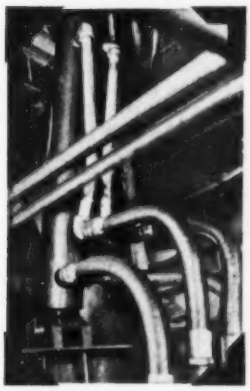
APPLICATION Hydraulic Medium

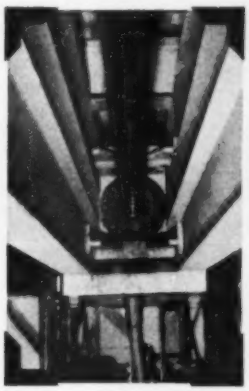
UNIT Hydraulically-operated sawmill-70,000 bd. ft. per day capacity

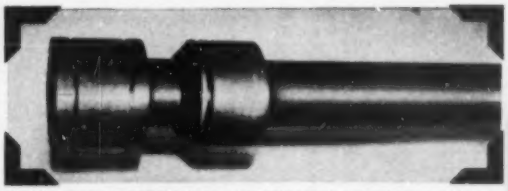
CONDITIONS Extreme temp. and pressures—cyl. + rods exposed to moisture

FIRM Ivory Pine Co. of Calif., Dinuba, Calif.

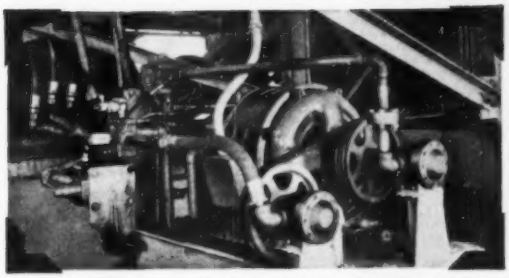
Inhibited oil stops thickening and foaming trouble







CALOL O.C. TURBINE OIL, AS HYDRAULIC MEDIUM in these cylinders, pistons, pumps, etc., operating feed works and other units of Ivory Pine Company's hydraulically-powered sawmill, has prevented any rusting, deposit formation, and leaks caused by foaming, since the mill started. Ordinary oil in similar units knocked out three pumps, lost 175,000 feet production. Note shiny, unrusted surface, and oil on 16' piston rod (left). When photographed, it had been idle in damp, foggy weather for three months!



"IN ALL SIX OF OUR HYDRAULIC SYSTEMS, CALOL O.C. Turbine Oil has eliminated oil foaming and 'jelling' trouble," says Mr. E. P. Ivory, president of the company, "And we've found no rust, even on our lift cylinder at the surface of the log pond."

REMARKS: Developed and built by The Peters Co., Portland, Ore., this new type sawmill is the most complete of its kind. Its logs, cut from a U. S. Forest Service Sustained Yield Unit, are hauled 50 miles to the mill during the summer so it can operate the year around.

How CALOL O.C. Turbine Oil cuts costs in hydraulic systems

Used as the hydraulic medium in feeds and lifts of any kind, CALOL O.C. Turbine Oil will not form carbon or foam excessively.

A. Contains very effective oxidation inhibitor—will not deteriorate and plug lines and retard action of cylinders.

B. Corrosion inhibitor prevents rusting and pitting—has high metal-wetting ability.

C. Separates readily from water or other contaminants—dirty oil may be reclaimed easily...charge lasts indefinitely, leakage only cause for replacement.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any one of the companies listed below.

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
THE CALIFORNIA OIL COMPANY • Barber, N.J., Chicago, New Orleans
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

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Jarvis
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JARVIS POWER TOOLS
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TECNI-TAPS
ROTARY FILES
FLEXIBLE SHAFTS and
QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

or various other luxuries, thereby contributing to a more stable economy.

So I believe that capital should cooperate with labor, and when it has encouraging reports, such as an influx of new work, the employees should be informed of it so as to relieve their minds and assure them of steady employment.

Milton E. Sussman
Brooklyn, N. Y.

•

TELEVISION EYES

ON A BASIS of cold logic, the separation of home life, (or personal), and business is difficult because they are inter-related—with the balance of responsibility resting strongly on the business side. Statistically, the average shop man spends eight hours in the shop, two hours traveling, eight hours sleep, and six hours at home. If we assume that the actual time spent in each of these endeavors has a relative effect on the employee (we can eliminate traveling and sleeping—inactive), we end up with eight hours of work versus six hours of home life. Any disturbing influence during either of these sessions will generally affect the other.

The real difference lies in the fact that when a man has a tough day at work he can come home grouchy and tired, throw his weight around for a little while, relax however he wants to, and get in a good night's sleep. But when a man has trouble at home he spends his "six hours" in frustration, doesn't sleep very well and arrives at work only because of determination, habit, or necessity — with no inclination to produce; much less improve.

This is where the employer or supervisor comes in. Though it's not

"Fine thing! You're boss of a machine shop and you can't even fix your kid's toy!"

SPECIALIZED CRAFTSMANSHIP

MEANS BETTER CASTINGS FOR BETTER PRODUCTS!

Call On

ECLIPSE-PIONEER Foundries

When you order castings from the Eclipse-Pioneer Division Foundries, you *know* they will be right. Your confidence is justified at *every step* in their manufacture, from first planning to final check, for each man is an expert in his field and each operation is backed by more than twenty years experience. But, this craftsmanship is only part of the picture. As a further guarantee of quality, the Eclipse-Pioneer Foundries use the most modern machines, techniques and testing devices obtainable . . . the entire production line is conveyorized to assure rapid and economical service on all orders. Take advantage of these extras. If you plan to use aluminum and magnesium castings, make it a point to consult Eclipse-Pioneer. Meanwhile, send for Eclipse-Pioneer's "Book of Facts".

ALL
Aluminum and Magnesium Alloys
Including the recently developed
Cerium and Zirconium Magnesium Alloys

AND PRECISION (±.005")

PLASTER MOLD CASTINGS

PLEASE SEND ME THE ECLIPSE-PIONEER "BOOK OF *FACTS*" ON MAGNESIUM, ALUMINUM AND BRONZE CASTINGS. AM

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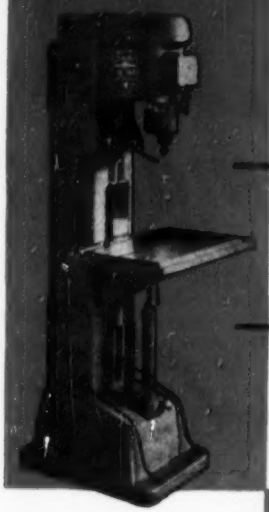
Bendix AVIATION CORPORATION

Never Before

SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

For Top Production



SNOW

FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

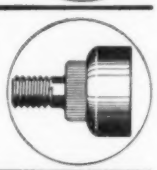
Crossdrill and C'T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine

TAPPING

Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine

THREADING

3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

SNOW

MANUFACTURING COMPANY
435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)

Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

Submit Sample Parts for Production & Cost Estimates

his fault, he is commanding the major part of the employee's active life. In his own interest it is the employer's responsibility to learn why a man is not "doing his job."

The employee was hired because he met the qualification demanded. He is kept on because his work is satisfactory. When something goes wrong with the man's production or attitude the employer can't just wash his hands. The fault might lie within his own province.

Through his supervisors, or personally, he has to learn the "why" of the situation. It goes without question that when he finds out "why," the problem can be solved —sometimes not too easily.

Definitely, the employee's private life concerns the boss.

If I can digress for a few paragraphs, I would like to point out that the employer or supervisor has to adjust himself to the individual employee — not the other way around. It's much easier for one man to get along with everybody than it is for everybody to try to get along with one man.

Many supervisors, afraid that another guy might get the job, forget the human element and try to compete mentally with guys that are working for them. They forget that they're just supposed to get the work out. Naturally the other guy gets his job because the boss isn't dumb and he's interested in a productive employee—regardless of status.

This might seem a little out of character in the machine business, where everyone is supposed to be serious and analytical, (I can't remember any jokes about fractions or decimals), but it's often very necessary for the boss to make a mistake. Makes the fellows think you might be human.

F. Biechele
Brooklyn, N. Y.

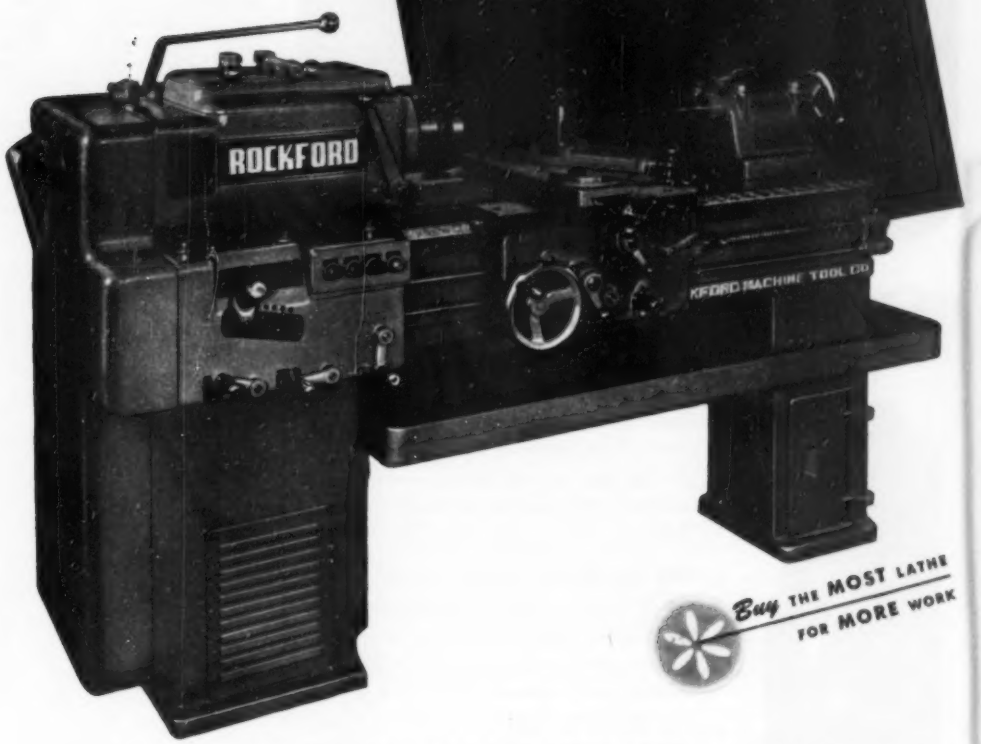
•

WHERE TO draw the line on minding the employee's personal business has been a great problem facing many companies. Should the company go whole hog and practically control all the outside activity of each of its employees or should it adopt a hands-off policy and let each individual decide for himself how to live, whom to be friends with, what church to attend and the like?

Many companies try to go down the middle path and some of them are more or less successful. The policy followed here is one of wait and see attitude. If the employee can get along in the community and his outside interests do not affect

GET • • •

GREATER NUMBER OF JOBS, FEWER NON-PRODUCTIVE HOURS ON A MEDIUM SIZE LATHE



Buy THE MOST LATHE FOR MORE WORK

● Usually only in larger, more expensive models do you find the combination of speeds, swing, centers, power, feeds and threads that are standard equipment on Rockford Economy Lathes. These features make it possible to machine a wider range of work with fewer non-productive hours than is possible with many machines in its class.

That's why we say it's the best lathe value on the market today. It is medium-sized and economy-priced, but it's built to handle any job that can be turned or threaded within 16½" or 18½" swing, 30" full or 35" maximum overhanging centers. 3100 lbs. of weight, 6' bed and zero precision bearings give it the rigidity and precision for turning out tool room accuracy. Doesn't that sound *right* for *more* production in your shop?

A Rockford representative will give you full details on these machines and we will gladly send our new bulletin No. 900A on request.

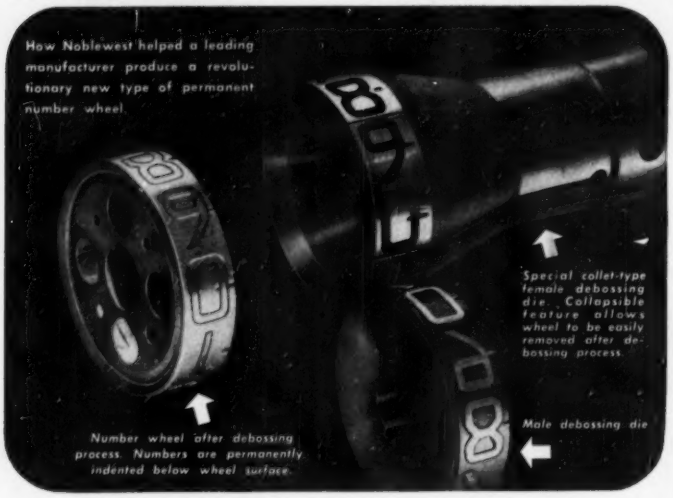
MEDIUM-SIZED
ECONOMY-PRICED

ROCKFORD ECONOMY LATHES—16" and 18"

513

ROCKFORD MACHINE TOOL CO. • ROCKFORD, ILLINOIS

LEADERS IN INDUSTRY MARK WITH NOBLEWEST


How Noblewest helped a leading manufacturer produce a revolutionary new type of permanent number wheel.
Special collet-type female debossing die. Collapsible feature allows wheel to be easily removed after debossing process.
Male debossing die
Number wheel after debossing process. Numbers are permanently indented below wheel surface.

HIGH SPEED *Roll-o-matic* DEBOSSING

THE PROBLEM—To produce metal number wheels with permanent numbers indented below the surface of the wheels—so that they couldn't wear off. They also had to be easier to read—and most important — they had to be produced in large quantity.

THE SOLUTION—Noblewest marking specialists were called in. The result was this high speed Model No. 297 Roll-O-Matic debossing machine that produces the desired indented numerals at production speeds up to 600 wheels per hour. The light weight aluminum wheels are placed on a special collapsible collet-type female die and rotated against a synchronized male die. This machine can be tooled for making raised (embossed) impressions as well as indented (debossed) impressions on circular thin-walled metal products in diameters 1½" to 4". For full information write The Noble & Westbrook Mfg. Co., 17 Westbrook St., East Hartford 8, Conn.

his work or his ability to get along with other workers, the company practices the hands-off policy. However, should the employee's outside activities interfere with his ability to work efficiently or to get along with the other plant employees, the company's industrial relations department makes it its duty to investigate the situation. This investigation often results in the clearing up of the unsatisfactory condition. Sometimes the employee needs the counseling that can be given by a director of personnel relations in order to understand how his (the employee's) action affects the company, his job and the community as a whole.

Yes, the position in which Ed finds himself is one that many supervisors and foremen have found themselves in in the past. Is one warning enough? Will the employee ever correct his ways? Is he or she worth keeping? These and many other questions confront the average supervisor. Shall we determine what is wrong with the worker and why he is always dead on his feet or shall we ignore this and just set up the hard and fast rule of "do your job or else?"

Another thing: Can you fire the man? What will the union have to say about it?

Yes, as Al comments, labor turnover is costly to a company and every worthwhile supervisor knows that it is better to keep a man if at all possible than to just dump him out and grab at the next floating straw tomorrow. Costs go way out of line with new employees so the policy should always be "try to save them, not fire them."

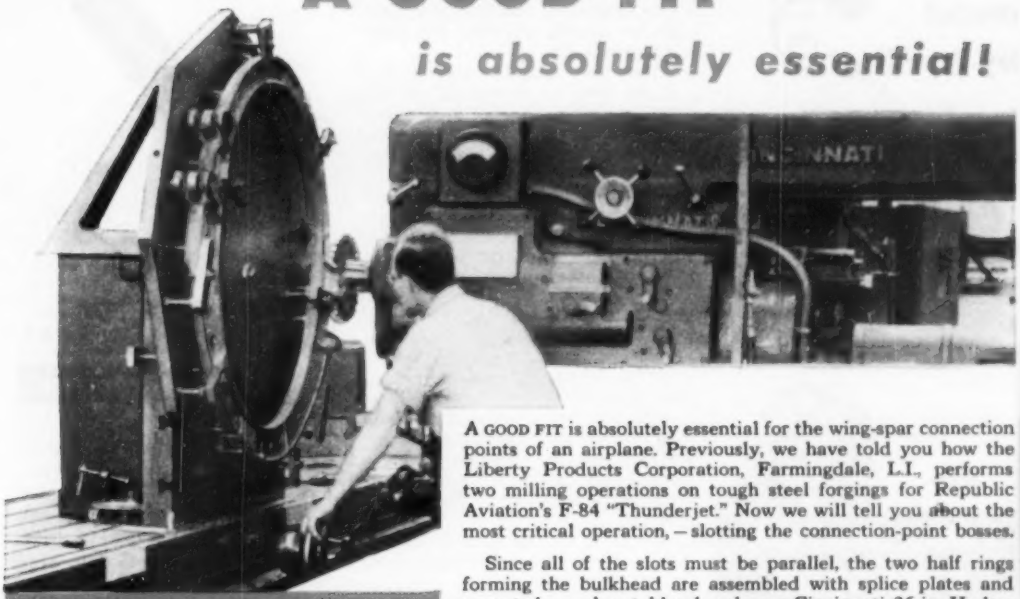
It is personally felt that a company should practice the wait and see

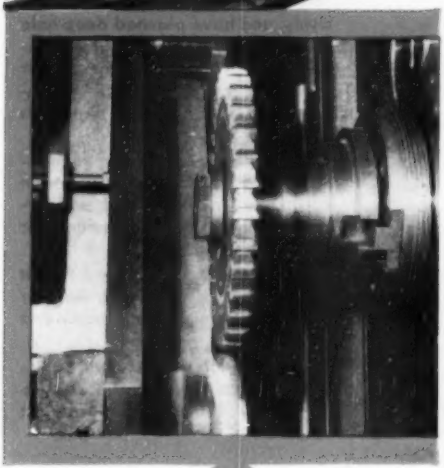
"Which model do you want?"

OK Carbide Cutters mill vital "Thunderjet" forgings – III

A GOOD FIT

is absolutely essential!





A GOOD FIT is absolutely essential for the wing-spar connection points of an airplane. Previously, we have told you how the Liberty Products Corporation, Farmingdale, L.I., performs two milling operations on tough steel forgings for Republic Aviation's F-84 "Thunderjet." Now we will tell you about the most critical operation, – slotting the connection-point bosses.

Since all of the slots must be parallel, the two half rings forming the bulkhead are assembled with splice plates and mounted on a box table placed on a Cincinnati 36-in. Hydro-Tel milling machine. The 8 slots in an assembled ring are milled with an OK 12-in biaxial slotting cutter to these tolerances: width, plus 0.002 in., minus nothing; depth, plus 0.010 in., minus nothing. One assembly is slotted per hour, and three pieces are produced per cutter grind. Spindle speed is 35 rpm and the feed rate is 2.5 in. per min.

It is not a happenstance that OK cutters are used for all three operations on this critical aircraft bulkhead. Liberty Products Corp. has standardized on OK cutters and uses them for a multitude of operations on more than 50 milling machines.

The inserted-blade principle developed and perfected by the OK Tool Company produces economical milling in plants making all kinds of products – airplane components, machine tools, printing presses and run-of-the-mine articles in all materials. Good performance starts with a heat-treated alloy steel body that easily absorbs the stresses of modern milling on high-powered machines. Blade slots are accurately located and machined, so that the tool is always in "geometric balance." Hence, each of the inserted blades is presented to the work at precisely the proper angle and all blades take chips of equal thickness. And because the wedge-shaped blades require no locking devices, they cannot come loose to spoil cutter work, but they are easily removed for replacement.

OK cutters are made in a complete range of sizes and styles. Blades are offered in high-speed steel, cast-alloy or cemented carbide. Cutter bodies are available with slots to position blades for positive or negative rakes, straight or shear cuts. And blades are interchangeable for several sizes of a specific style of cutter.

Further reasons on why it pays to standardize on OK cutters are found in Catalog 13. Write for your copy.

OK

modern milling cutters for modern milling machines

THE OK TOOL COMPANY, WILTON, New Hampshire
Division Williams and Hussey Machine Company, Inc.

don't scrap metal by turning!

...save by Swaging

on

TORRINGTON SWAGERS

The Torrington Rotary Swaging Machine uses every bit of stock. With 4000 hammer blows a minute, swaging reduces, sizes, rounds, tapers and points rod, wire and tubing. It makes metal tougher and more resilient. It hammers away minor surface defects.

Torrington Swagers are built to a mechanical perfection based on our 42 years' swaging experience. Send today for your free copy of the illustrated booklet describing the machine and the method.

THE TORRINGTON COMPANY
Swager Department
559 Field Street • Torrington, Conn.

Send the coupon today for your free copy of this booklet.

Please send a copy of "The Torrington Swaging Machine" to:

Name_____

Firm_____

Address_____

policy on all employees. Then give guidance where guidance is needed. Most people resent being controlled and sometimes cause more trouble than if left alone. You must learn your employees. Find out what they do for outside activities but keep your hands off.

The less company interference is, the more successful will be the business. The personnel department and the supervisors should select employees carefully when hiring. Check what an employee does with his spare time, what his interests and hobbies are before you hire him. Screen out those whose interests are questionable and might be detrimental to his own and company welfare.

Most employees do not like to be told how to spend their free time when away from the job. Therefore, so long as thought is given in selecting the right employee to start with, let him use his free time as he will so long as it does not materially affect the worker, the work he accomplishes for the company or the community in which he lives. He should be allowed to live his own life.

Charles D. Townsend
West Hartford, Conn.

•

WE HAVE the question: does any company official have the right to inquire into the private, off-the-job reasons that cause an employee to show up on the job with bleary eyes, or in any other condition which tends to lesson his capacity to handle his job?

And the answer can only be—Yes; he does have the right! Not only does he have that right, it is part of his job to ascertain the causes and reasons that induce any of his men to show up on the job in such condition that their usefulness as workers is impaired; and it is his duty to correct this condition if possible.

Only in Russia, where some human beings have a few privileges, but absolutely no rights, can a man be shot because his superior finds fault with his production record.

In America, there is no open season on human beings for any reason whatsoever; even the murderer is guaranteed a trial.

The president of any successful company will spend the greater part of his time watching and studying his key men. The president knows that if his key personnel are sober, contented, and at peace with the world, they will handle their jobs efficiently, and the business will move ahead.

But if the purchasing agent accepts too much entertaining, and be-

A heavy "hour glass" worm gear shaft with deep hole extending its entire five-foot length.

Deep Holes...

a Complete Service

Production drilling and boring of deep holes, especially in hard alloys, is vastly different from other machine shop work, and until recently has been practiced in but few industries.

We have kept accurate data over years of drilling deep holes exclusively, and have planned deep hole production for many leading industrial firms. You too can employ our planning services at a nominal engineering fee and avoid high costs and costly experiments.

After careful study of your requirements and facilities, we will design and make the cutting tools, and furnish you the exact requirements for making them work.

Or, in many cases, you will find it best to have us do your drilling for you in our own specially equipped plant.

For Deep Holes—Exclusively . . . and for machining operations where deep hole drilling is the dominant feature . . .

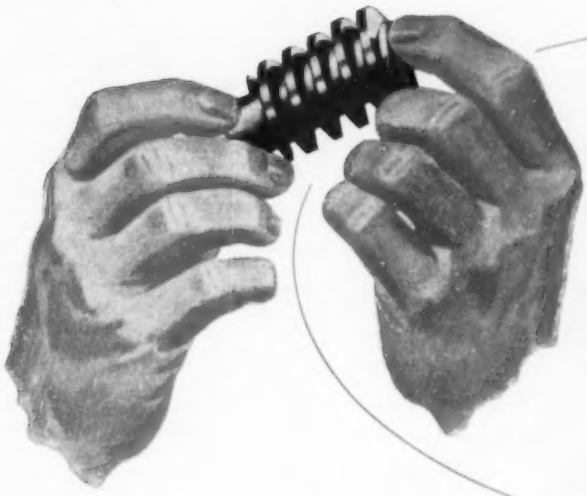
Conner Tool & Cutter Co.

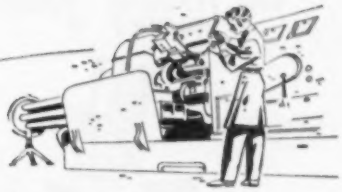
1000 East McNichols Road, Detroit 3, Michigan

CONSULTANTS • DESIGNERS • TOOL MAKERS • DRILLERS

Deep hole drilling machine in Conner Co. shop, at work on the worm gear illustrated above.

GET THEM BOTH!

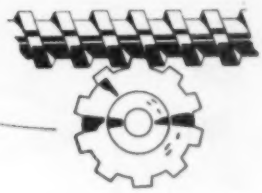




MACHINABILITY

and

WEAR-RESISTANCE



with *Republic* COLD DRAWN ALLOY STEEL BARS

Machinability that enables you to produce small metal parts efficiently and economically . . . *wear-resistance* that enables those same parts to stand up under severe service . . . you get both *and more* when you use Republic Cold Drawn Alloy Steel Bars.

Produced by Republic's Union Drawn Steel Division, these bars are unsurpassed for close tolerance, accuracy of section, fine surface finish and UNIFORM MACHINABILITY. They are strong, tough, and uniform in response to hardening treatment. They're made to withstand shock, strain, wear and heavy loads without weakening.

Republic Cold Drawn Alloy Steel Bars are available in all popular analyses, in standard shapes and sizes, and furnace treated (annealed, normalized, spheroidized, stress relieved or carbon corrected) to your requirements.

Republic metallurgists and machining experts will be glad to show you how to use them to greatest advantage. Write, wire or phone:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic COLD DRAWN
REPUBLIC STEEL
ALLOY STEEL BARS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

Threadwell Tools do many jobs

they can do your tough ones

Solving your gaging and cutting tool problems is easier than you think. Threadwell Field Engineers are located all over the country to help you. Get their names by mailing coupon below.

THREADWELL TAP & DIE CO., Greenfield, Mass.

Please send me the name of the Threadwell Field Engineer and the Threadwell Distributor nearest me. I am also interested in the literature checked below.

Name_____ Pos_____

Company_____

Street_____

City_____ Zone____ State_____

Taps ☐ Dies ☐ Drills ☐ Counterbores ☐ Keyway Broaches ☐ Gages ☐

Threadwell

comes a boozer and loose talker; if the sales manager has a wife he can't handle, or acquires a demanding mistress; if the chief engineer develops an overpowering bridge or golf complex; if the works manager spends his mornings handicapping the ponies; if the treasurer is a stock market expert, in hourly phone touch with his broker—if any or all of these happen—and they do happen—then the business suffers.

Any president will make at least one effort to save an erring executive. I have done it many times—sometimes successfully, but not always so. Sure—the man may be discharged, but his successor may always be worse; so it pays to give the man a chance.

In most organizations this policy follows down the line. Any good foreman knows the first day when one of his men steps out of line. The chronic boozers and layoffs automatically weed themselves out; but when a man, who has had a uniformly good record, suddenly starts going bad—then you have the case of a man who rates a little attention. He shouldn't receive just a warning, but his superior should make a sincere effort to find out the source of his trouble, and help him with advice to correct it. This is not butting into an employee's private affairs; this is merely helping the company to salvage a trained employee. When off-duty affairs interfere with an employee's capacity to handle his job—his bread and butter—then those affairs are no longer entitled to privacy.

I don't believe anybody will ever improve on the Golden Rule: Do unto others, as you would have them do unto you!

James K. Matter
Detroit

•

EVERY individual in a shop or community affects the rating of the group, thus raising or lowering the average standing of the group and making it of importance to everyone to do something about it.

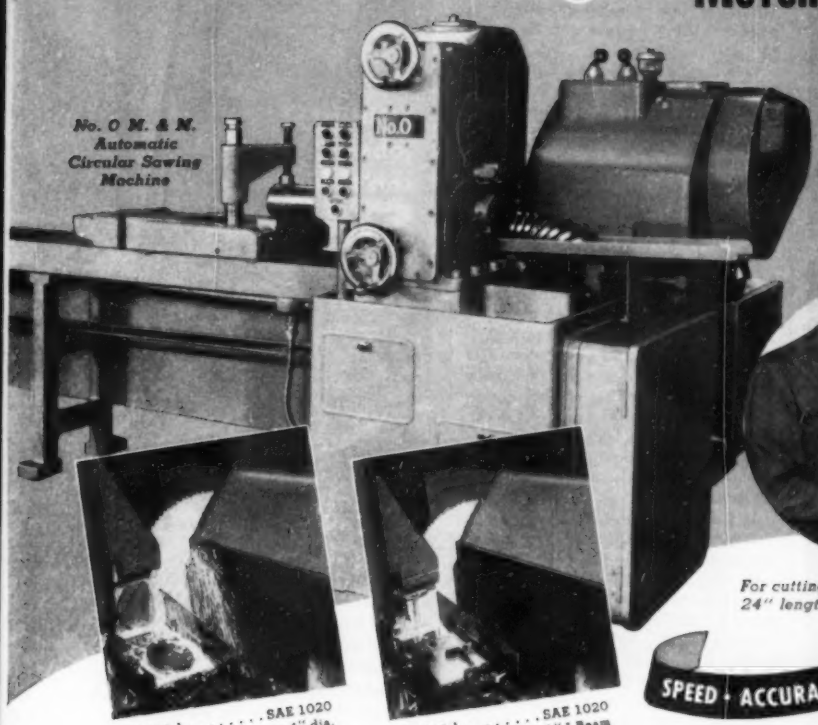
While some may feel that their responsibility ends with their individual conduct the fact remains that they are affected by their neighbors and that they are to a certain extent their brother's keeper, therefore to maintain or improve existing conditions the individuals need to lend a helping hand.

This of course should be done in a way that will not disturb the peace of the neighborhood unnecessarily.

There is no doubt but that a per-

PRODUCTION .. the Call of the Hour!

GET IT WITH MOTCH & MERRYWEATHER Automatic Circular Sawing Machines!



No. 0 M. & M. Automatic Circular Sawing Machine

For cutting off ferrous or non-ferrous stock up to 24" length and 4" diameter, round or square.

Material . . . . . SAE 1020
Size . . . . . 4" dia.
Sawing Time . . . . 50 seconds

Material . . . . . SAE 1020
Size . . . . . 3" I-Beam
Sawing Time . . . . 22 seconds

Material . . . . . SAE 1020
Size . . . . . 1-¾" x 3"
Sawing Time . . . . 20 seconds

Material . . . . . SAE 1020
Size . . . . 3" O.D. x ⅛" wall
Sawing Time . . . . 28 seconds

SPEED · ACCURACY · SQUARE ENDS · LOW COST

Higher production lowers your cost per cut-off piece, together with extreme accuracy which eliminates many second operations. This little giant of production will save you money in tool costs and get your work out faster.

Investigate! Ask for Bulletin No. 150-A.

★ ★ ★

Look to Motch and Merryweather for production cut-off machines handling stock from ¼" through 18" diameter, as well as machines for special applications, including sawing with simultaneous second operations. M. & M. builds circular sawing machines, automatic saw sharpeners and circular saw blades, transfer and special machines.

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

SPECIFY
dy chek
dye penetrant
metal inspection

Simplified
Non-Destructive
Testing...
Any Metal—
Anywhere

FASTER,
CHEAPER,
MORE ACCURATE
Completely
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dy chek COMPANY
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of
Northrop
Aircraft,
Inc.

1535 EAST BROADWAY
HAWTHORNE, CALIF.

son's home life and private business does in many cases affect his value to his shop employer, therefore, it is of interest to an employer that the employee's home life is not debasing or intemperate.

We should all accept the responsibility of improving conditions and customs in our neighborhood to whatever extent needed and wherever anything helpful can be made use of.

Don't wait for George to do it.

H. B. Martin
Watervliet, N. Y.

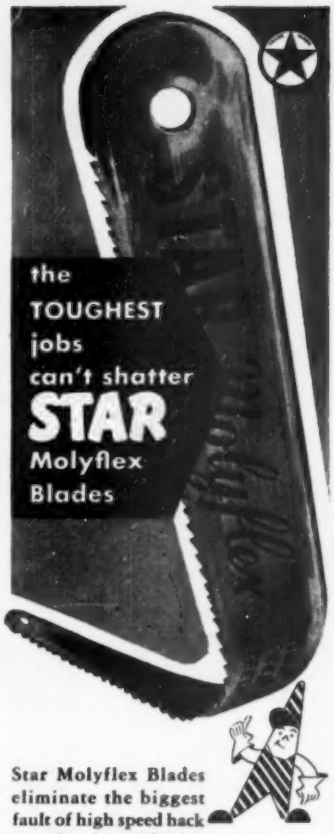
•

THEORETICALLY, when a man with an acquired skill hires out that skill, he is morally obligated to exercise it to the best of his ability for the benefit of his employer and it is perfectly legitimate for the employer to expect him to do so—the employer is paying for the use of the man's skill and anything tending to lower the efficiency of the man's skill becomes a matter of concern to the employer.

The extent to which an employer should inquire or pry into a man's personal affairs should be limited to the causes which affect the man's efficiency in the shop.

If a man is ill and tries to struggle through the day "because he needs the money"—he is not being fair to himself or to his employer and it would be wise for the employer to ascertain the extent of the illness and to send the man home or to a doctor—also it is good policy to find out if his illness is the result of some condition of the job or in the shop, in which event steps should be taken to remedy the condition. However, if the man persists in trying to do

"Well, here I am, back again—let's see a great big smile."



Star Molyflex Blades eliminate the biggest fault of high speed hack saw blades. ***They're completely shatterproof and unbreakable in a frame.*** **That's true no matter how tough the job may be.**

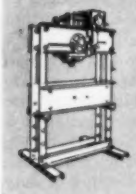
And Molyflex leads the field in cutability. Tests prove that Molyflex Blades cut 23.8% better than the average of 8 leading brands of high speed flexible blades.

Your Star Supplier stocks the complete Star line of hand and power hack saw blades, frames and bands.

He also has the handy Star Wall Chart and the useful 32-page booklet, "Metal Cutting". Both are packed with valuable information on blades and cutting techniques. Get your copies today. They're FREE.

CLEMSON
BROS., INC. • Middletown, N.Y., U.S.A.
Makers of hand and power hack saw blades, frames, metal cutting band saw blades and Clemson Lawn Mowers

Unusual machines for a wide variety of industrial applications



1. 150-Ton Electdraulic Press

Motor driven heavy duty hyraulic press; pre-set controlled tonnage; ram speed 12" down, 13" up per minute; ram travel 12"; bolster travel 28"; work can be fed from side or front; one operator can center work and control press.

2. Reamers, Dual Spiral

Dual spiral cutting action, one dual spiral reamer replaces five standard expansion reamers, straight or tapered shanks.

3. Tool Post Grinders

Attachment for lathes, shapers, planers and millers; Applications: internal, external, face and taper grinding.

4. Presses

For every purpose, sizes: 2 ton, 3 ton, 10 ton, 25 ton, 40 ton and 60 ton, hand, hydraulic, air or motor driven.

5. Ball Bearing Die Sets

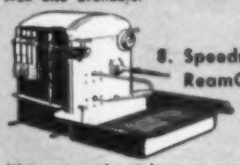
Features ball bearing bushing, long die life, perfect alignment, cleaner cutting.

6. Hypermatic Punch Presses

Revolutionary, reciprocating action, High speed blanking press capable of 1800 strokes per minute.

7. HGX—Grinder—Lathe

Combines work of grinder, lathe and borer; 53" swing; automatic cross feeds! hollow work spindle; face plate; grinds or turns large surfaces, internal and external tapers; small model ACX also available.



8. Speedmaster ReamORhone

Wet ream and wet hone on one machine, quickly interchangeable from reaming to honing.

9. Mobilcrane

Eliminates need for overhead hoists and rails, capacity up to 2 tons, boom travel to to 6'8" (Boom extension available) Portable.

10. Diesel Engine Crankshaft Grinders

Resizes and reconditions large railroad engine crankshafts up to 224 inches length, 40 inch swing; other models up to 382 inches length 60" swing. Also cylindrical grinding operations. All of the accuracy and features of the smaller world-famous Lempco automobile and truck crankshaft grinders.

11. Disc Surface Grinder

Tilt-table, spring floated disc grinder with coupled air suction and waterfall grit remover. For flat grinding of castings or other metallic surfaces up to 19" wide. Larger wet grinding fully automatic models also available.

PRESSING POWER from a feather touch to 150 TONS

An unusual heavy duty 150 ton hydraulic press with extremely sensitive control. Operator can bend the shell of an egg without breaking it or can exert 150 tons at will.

Incomparable for riveting, pressing, bending, straightening and broaching heavy assemblies without damages due to excessive tonnage or uncontrolled power surges. Set any desired tonnage up to 150 tons, the gage mechanism prevents overload and insures accurate repeat pressures. Write for Bulletin 150 Ton. Also write for complete information on various types of air, manual, electric and hydraulic presses (17 models).

Special presses built to specifications.

LEMPCO PRODUCTS, INC.
Industrial Division
5490 DUNHAM ROAD
BEDFORD, OHIO

LEMPCO

For 35 Years—a leading builder of machine tools

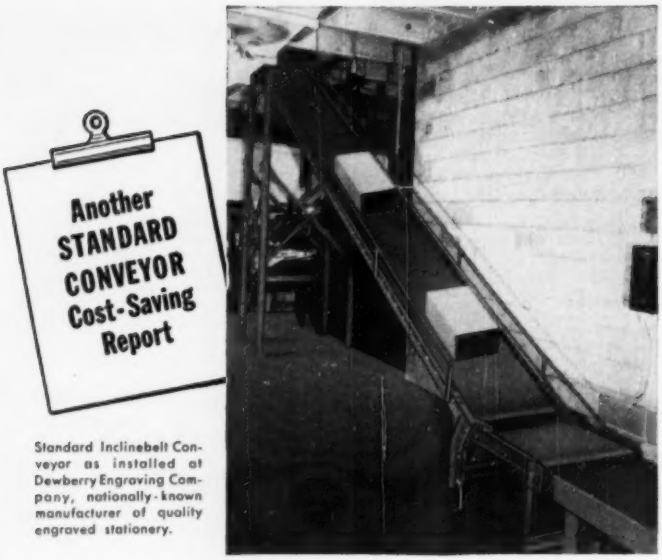
SEND COUPON FOR DETAILS

LEMPCO PRODUCTS INC. (Industrial Division)
5490 DUNHAM ROAD • BEDFORD, OHIO

Gentlemen:
Kindly send additional details on the following equipment or machines:

☐ 1. 150 Ton Press ☐ 2. Reamers ☐ 3. Tool Post Grinders ☐ 4. Presses ☐ 5. Die Sets ☐ 6. Hypermatic ☐ 7. HGX Du-All ☐ 8. ReamORhone ☐ 9. Mobilcrane ☐ 10. Diesel Crankshaft Grinder ☐ 11. Surface Grinder

COMPANY .....
NAME .....
ADDRESS .....
CITY ..... ZONE .....
STATE .....



Another STANDARD CONVEYOR Cost-Saving Report

Standard Inclinebelt Conveyor as installed at Dewberry Engraving Company, nationally-known manufacturer of quality engraved stationery.

Conveyor EARNS its ORIGINAL COST in First 3 Months

Dewberry Engraving Company, Birmingham, Alabama, nationally-known manufacturer of quality engraved stationery, writes us as follows:

"We installed one of your belt conveyors about two years ago. It has never required $1.00 in repairs and has worked perfectly every day. We operate 3 shifts, 24 hours a day and produce the largest quantity of engraved stationery in America. Your conveyor saved us its original cost in the first three months of operation. We have moved tremendous loads, far above the capacity you advise — without once stalling the conveyor. We do not see how we could operate without it."

Conveyors cut costs—speed operations — can do the same for you. Standard builds conveyors to handle "packages" of all types — bags, boxes, bundles, barrels, drums, cans, cases, cartons. Available in light, medium, or heavy-duty types — portable or stationary — systems, sections, self-contained units — power or gravity fed — yield remarkable savings in time, money and manpower.

Check your handling problem with Standard.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul 9, Minn.

Write for Standard's General Catalog No. AM-120. Tell us what you want to handle or type of conveyors on which you want information.

Standard
GRAVITY & POWER
CONVEYORS

Engineered Conveyor Systems — Portable Conveyor Units — Spiral Chutes — Pneumatic Tube Systems

his job while half asleep or "off the beam" he should be told that he has been noticed and a frank inquiry into the matter should be made—explaining that it is to the interest of all concerned that he snap out of it—and he should be given ample opportunity to do so.

Insofar as shops are expected to be run efficiently it would seem that there isn't much time to fuss over a man's personal affairs and any man worth his salt would not care to have his personal affairs pryed into—so, after bringing the matter to a man's attention with an offer to help him to help himself management can leave it up to the man's sense of duty and fair play, to snap out of it within a reasonable time or else quit or be laid off—he should be made to understand that there is a limit beyond which no tolerance will be given.

Henry George
Dayton, Ohio

•

HERE is the case of an employee who reports for work so bleary-eyed he is unable to satisfactorily perform his duties. According to the wording of this problem the supervisor has made no attempt to figure the workman out. This was mistake No. 1 for Ed. Al suggested to Ed that he talk the matter over with the employee. This good advice was ignored. Mistake No. 2 for Ed.

Instead of trying to find out what made the employee act the way he does, Ed threatened the employee with the loss of his job.

That was mistake No. 3 for Ed.

Last but not least Ed does not recognize the fundamental good principles of human relations. Mistake No. 4 for Ed.

A supervisor like Ed who thinks only of himself is hopelessly uneducated no matter how instructed he may be. The supervisor should think of himself in the same position as a football or baseball coach. He should be interested in the employees' welfare both physically and mentally. We must set a good example. We must find the cause before we can hope to effect a cure. We often make the mistake of thinking the employee is peculiar when his actions do not conform with our own idea of how he should behave. A friendly approach, a frank discussion and a blending of thoughts will go a long way in getting the facts. We can usually correct the fault and make the cure seem easy without discord or ill feeling.

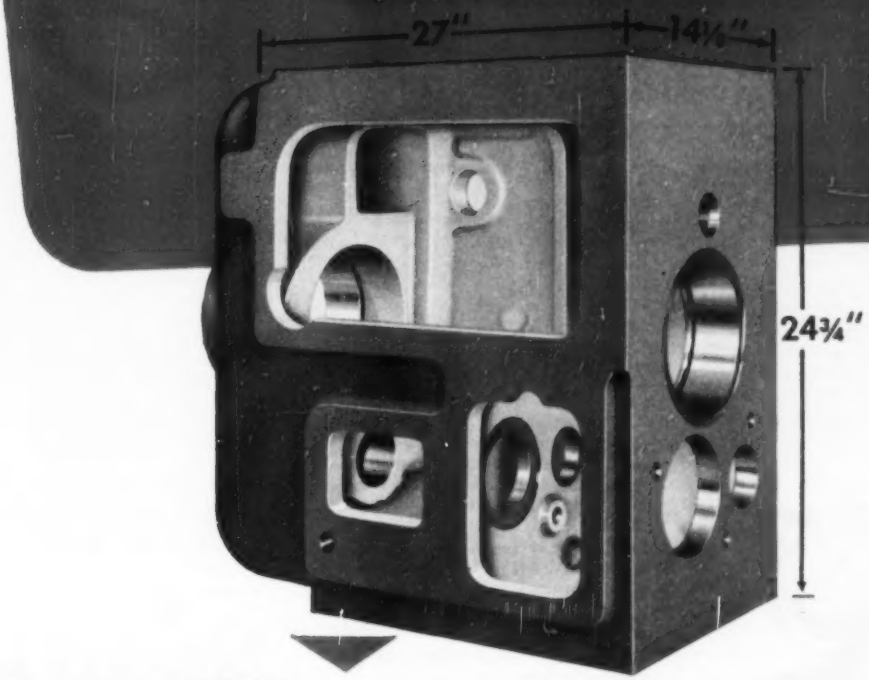
A. E. Salmons
Philadelphia

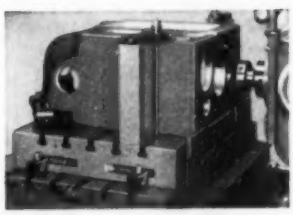
THE "JIGMIL TECHNIQUE" MAKES

JIGLESS BORING

possible on small lot production

- FAST PRODUCTION AND HIGH ACCURACY
- FLEXIBILITY OF APPLICATION FOR SMALL LOT PRODUCTION
- SUBSTANTIAL REDUCTION OF TOOLING COSTS





This casting is processed in lots of 12 on a Model 3B Jigmil. "In Line" Bores are machined with simple Stub Boring Bars to Precise Limits of Alignment by Indexing Workpiece 180°.

Come to Detroit and Investigate the "Jigmil Technique"

Demonstrations at our Plant by Appointment

DEVLIEG MACHINE CO. DEVLIEG JIGMIL 450 FAIR AVE. FERNDALE 20 (DETROIT) MICH.

Replacing their tool check system paid a big return in Precision Castings Company's die shop in Syracuse, N. Y., proving again that . . .

SMALL SHOPS, TOO, NEED BETTER CONTROL OF TOOLS

"I would use McCaskey Tool Control if I had only 20 men drawing tools."

Mr. Edward Burtt, Precision's Stores Foreman, makes this statement without qualification because of the results he saw from their switch to McCaskey.

A great effort had been made to control tools with their check system, but production delays were frequent and tool expense was high. The picture changed the day McCaskey operation started:

(1) Approximately $2500 worth of end mills alone were recovered from machines, tool boxes and benches.
(2) Numerous other tools also were found.
(3) Monthly tool purchases dropped immediately.
(4) Delays, machine down-time and idle time of operators caused by missing tools were eliminated. They know now what tools they have and where they are.
(5) Crib inventory was reduced through knowing monthly activity of each item.
(6) Tool breakage is being cut by quickly identifying sources of trouble and correcting them.
(7) Crib service is much faster with no increase in personnel.

Let us tell you how similar savings in tools and time can be made in your shop. Mail coupon today for pamphlets giving you all the facts.

THE McCASKEY REGISTER CO.
ALLIANCE, OHIO

Send me the facts on McCaskey Tool Crib Control.

Name .....
Position .....
Company .....
Address .....

AM 12-50

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

WHO PICKS THE BOSS?

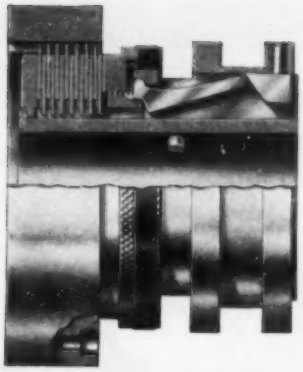
ANY doubt at all of management deciding upon whom it should employ as an executive, regardless of the desires or suggestions of the workers, is a question likely to make some of the peacefully sleeping old timers roll over in their graves. And—oh my gosh;—whether management should be governed by the advice of shop stewards is one that would certainly make the resting ex-metal-busters turn flip-flops in their confining boxes. In the old days a foreman was hired for the express purpose of squeezing the employees for all he could get out of them. The worker had no say whatsoever as to how things were to be run around the plant; he had to do as he was told, whether he liked it or not, and his conveniences were ignored entirely. But the worm turned soon after World War I. And during World War II, while management was too busy panning the easy nuggets, labor was preparing to let the world know that it was going to have some say as to how business should be run—especially the gains to be had by labor. Power heaped upon power so fast that the preponderance of dictation became such that business direction was like a train consisting of a dozen 2-8-8-2 compounds pulling a caboose. Tojo pulled a fast one and impetus was given government and industry and as a consequence we had labor telling management what to do—just the reverse to the way things were when the worker was told to do this or else.

A boiler will withstand just so much pressure and if there is not a proper balance of potential, rip goes the seam. If business administrators in past years had done less dictating

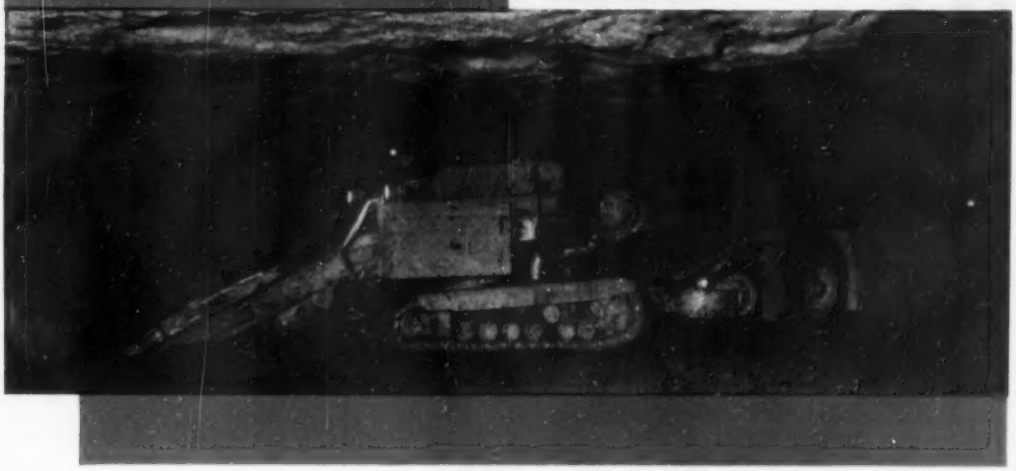
"The boss promised me a little surprise in my pay envelope this week."

MAXITORQ

Keeps Good Company ....



in the MINING FIELD



We are pleased this month to pay tribute to the Joy Mfg. Co., Pittsburgh, Pa., for its remarkable 18-HR-2 Rock and Ore Loader ... and to express our gratification for their selection of Maxitorq Clutches as original equipment.

Two double No. 27 Maxitorq floating disc Clutches ... one for each crawler tread ... control the power for independent forward and backward movement that permits precision maneuvering and positioning of the loader.

Only a ruggedly-built clutch can stand up under the tough going of this "battleship" machine that loads up to *12 tons of ore per minute*. Maxitorq is taking the job in its stride.

If you have a tough job requiring positive clutch action and long life ... or an application calling for overload protection of a shear pin nature ... ask our engineers for practical recommendations. Within its capacity (to 15 H.P. at 100 r.p.m.) there's no finer clutch made.

Send for Catalog No. AM12

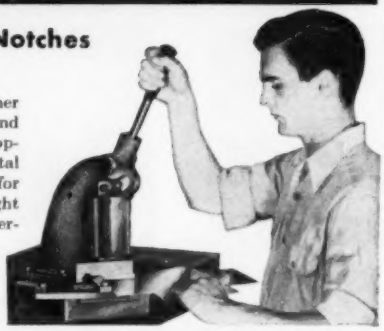
BCJ80

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT

THE di-acro NOTCHER

Duplicates Precision Notches WITHOUT DIES!

The new precision DI-ACRO Notcher eliminates the need for punch press and dies on many production notching operations. It is also ideal for experimental work as it can be quickly adjusted for any size or shape notch. Many straight shearing operations can also be performed with this flexible unit.



CUTS CLEAN—NO BURRS OR ROUGH EDGES

The powerful DI-ACRO Notcher has an exclusive roller bearing cam design which provides a tremendous pressure with a small amount of effort. The precision-ground Vee-shaped ram and blades of alloy tool steel assure clean cuts and permanent accuracy.

LARGE CAPACITY. The DI-ACRO Notcher cuts 90° notches up to 6" by 6" in 16 gauge steel in one operation. Larger notches, and wider or narrower angles, can also be obtained.

SEND FOR 40-PAGE CATALOG. Gives full information on all six "DIE-LESS DUPLICATING" production boosters—DI-ACRO Benders, Brakes, Shears, Rod Parters, Punches, Notchers—with many examples of accurately duplicated parts.

DI-ACRO is pronounced "DIE-ACK-RO"

← DI-ACRO PRODUCTION EXAMPLES

DI-ACRO DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

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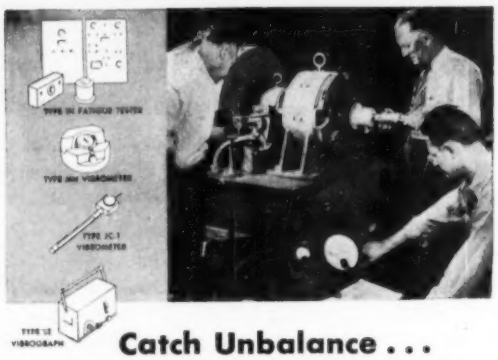

Catch Unbalance . . .

***before* it costs you money!**

Static and dynamic unbalance in rotating parts can cost you time and money. The Westinghouse Type HQ Portable Balancer is exactly the equipment to balance rotors at operating speeds in their own frame and bearings. Compact and with a wide operating range, this balancer is the leader in its field... just as are other types of Westinghouse vibration equipment.

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Westinghouse

PORTABLE BALANCER

and taken labor into its confidence as being part of industry they would have built up no such resentment and vindictiveness in labor. If labor presses its advantages too far it can result in one thing only: complete government control of business—"Harryism" on a gigantic scale, or, that bogy of free enterprise: socialism.

It has been said that socialism is a system where equalization takes place—sort of an if you have two cows and I have none you give me one and we'll both be happy. Horsefeathers! It means that you and I take over the feeding of the animals and "Harry" (the government) will send one of his henchmen to collect our pails of milk and, as a reward, will give us a permit to keep the droppings so that we can spread it around to enrich the soil so as to enable us to grow more alfalfa and grain to feed our cows so they can produce more and better—ah, ta hell with it!

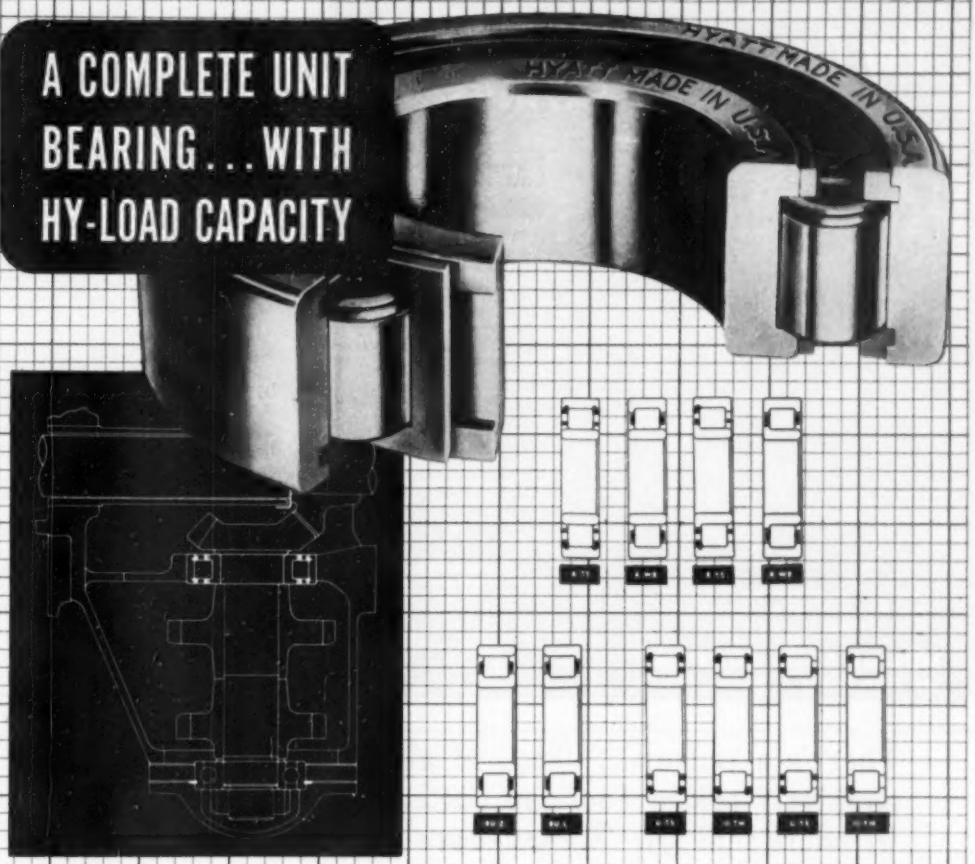
Well, so far, this article started out with the tribulations of labor and ended up with nourishing fertilizer. What I want to emphasize is that successful business depends upon the cooperation of the shop executive and his men—cooperation of labor and capital. It cannot run successfully half slave and half free and it's not going to run in any system where both are slaves driven by the restraining red tapes of government control. Dictation without reason is bound to end up in loss, whether it is being done by the employer or the employees. Cooperation entails consideration of both parties in all matters affecting each other. It has been shown that where management has been fair in its dealings with the workers—letting them feel as though they are a part of business instead of intimating that they are money-sucking parasites—that greater benefits will ensue. Viva la free enterprise! Down with dictators, be they Capital, Labor, or Government.

J. Homewood
Ontario, Calif.

•

SOME time ago, the building maintenance supervisor came down to my office with two carpenters loaded down with tools. He told me he had orders to relocate my office. I had been given no advance notice. Naturally I was resentful. I told the maintenance supervisor that he could not start this job until I was personally given notice of change. Later that same day I was called

A COMPLETE UNIT BEARING . . . WITH HY-LOAD CAPACITY



HERE is a cutaway illustration and typical application of the "U-TS" type Hyatt Hy-Load straight cylindrical bearing which has rollers, separator and races assembled into a single non-separable unit. The inner race has flanges and the outer race is grooved at both ends to accommodate retainment rings. The rollers are separated and spaced by a one-piece separator.

The "U-TS" type bearing is often employed in applications where no shoulder or stop is provided to retain the outer race in an axial direction or where the bearing must be assembled as a unit.

Separable inner race, separable outer race and complete unit Hy-Load Bearings are available with varying combinations of retainment rings and flanges to fit a wide range of application requirements.

• • •

Full information about all Hyatt Hy-Load Roller Bearings is contained in Catalog 547 . . . a complete engineering guide to radial bearing selection and use. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

For Greater PRODUCTION EFFICIENCY SAVINGS

use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
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MODEL HU68 universal joint type driller performing core drilling, reaming and facing operation on forged steel parts.

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See why at your "K-O" distributor . . . or write for descriptive literature

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ABERDEEN, SOUTH DAKOTA

over to the superintendent's office. The superintendent told me why he wanted the space the office then occupied. I argued that the office could be in a more favorable location and made several suggestions, one of which was adopted. Before I left, the superintendent told me of other plans and asked my opinion on them. Before leaving his office he asked me to keep an eye on the erection of the new office and if not to my satisfaction to let him know.

This superintendent knows the fundamental good principles of human relations. He knows how to put the employee at ease. He knows we all work better under the spirit of approval. He knows how to make the employees feel they are a part of the organization. The top brass right down to the fellow who sweeps the floor likes to feel he is important. We all like that feeling of recognition for some particular good quality or ability.

Certainly the employees should be informed of any change. They should be notified even if the change affects them only indirectly. If the employees were informed in advance there would be a lot fewer grievances in the shop. All too often the foreman is running the plant engineering-wise, while the department is being run human-wise by the steward. Naturally the management has every right to pick the foreman most desirable for management requirements. However, management should make known its selection in advance. If there are any objections by the rank and file, management will soon hear about it. Future management will have to remember

"A man convinced against his will
Is of the same opinion still"

We must start right now and recognize that it is not problems that bother us so much. We can work out our problems, but it is people that bother us most. We must learn more about this problem of dealing with people. We must stop this habit of both labor and business in trying to outguess each other. We must deal fairly and blend our thoughts and ideas so that both sides feel they can attain the things they both seek.

A. E. Salmons
Philadelphia

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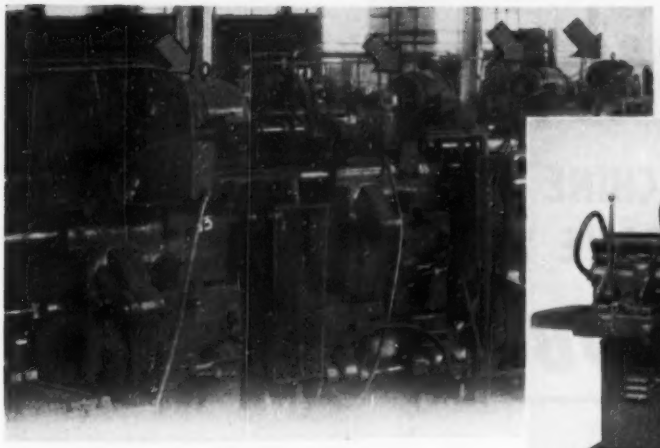
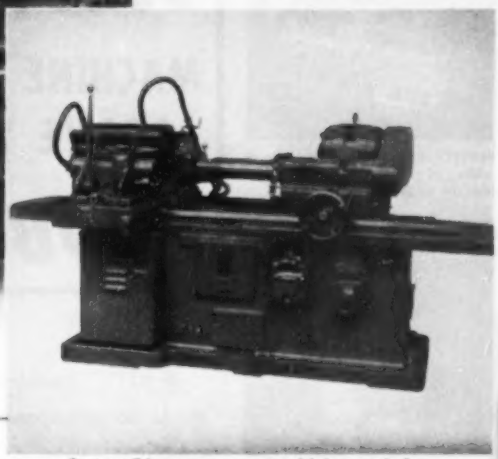
SELECTING foremen is a much more serious matter than is generally understood. Many workers are recommended as foremen by their own foremen and simply because they are easy to handle and always willing to do what their foreman tells them to do, and not because



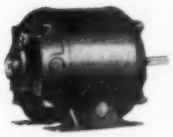
Four Century 5 horsepower squirrel cage motors operate milling machines



Century 5 horsepower motor driving a grinder

Century

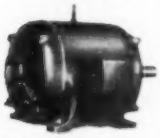
TYPE SC-
SQUIRREL CAGE MOTORS



⅛ to ¾ horsepower

1 to 1½ horsepower

2 to 15 horsepower



20 to 125 horsepower

150 to 400 horsepower

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The correct selection of the right combination of motor type, speed, power, torque, frame and mounting keeps Century motors on the job; reduces production headaches.

Team work between your motorized equipment producers and Century motor engineers means that you always get the right motor—selected from Century's wide range of types and kinds, in sizes from ⅛ to 400 horsepower for single or polyphase alternating current and direct current. You can be confident that you get top performance from the fine equipment these motors drive.

Skillful application makes sure that Century motors meet the exacting requirements of the machines they drive. That's your assurance of dependability.

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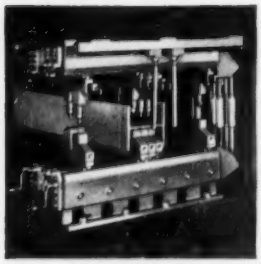
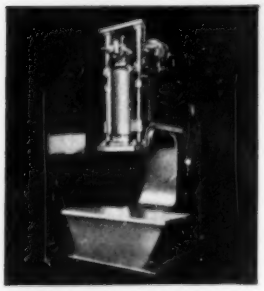
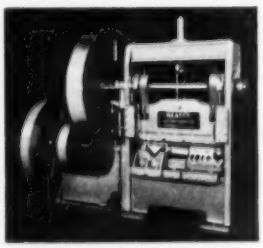


BEATTY Adjustable Tools punch webs of beams and channels, legs of angles and plates.



BEATTY 250-Ton Gap Type Press for forming, bending, flanging, pressing.



BEATTY Guillotine Bar Shear for "short order" shearing without changing tools.

BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.

WHICH MACHINE MIGHT SOLVE YOUR PROBLEM

BEATTY machines are tailor-made to solve certain production problems — to do a job better, faster, at less cost. And this long and varied experience qualifies our engineers to grasp your problem quickly and to provide a practical, proven solution.

There is a better way to handle most production problems, and our engineers are dedicated to finding that better way. If you have a problem, write us. We have the answer.

HYDRAULIC PLATE METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

they have proven themselves to be above the average in skill, ability and common sense; in other words, Yes-men. And, of course, a man of that type may also be a good leader, but chances are that a too easily led is not a leader himself.

The first criterion of a good foreman is that he has an opinion of his own. How can he otherwise make decisions that will be profitable to his company? A good foreman is also a good organizer and a pusher. If he be foreman in a shop with mixed production or in a tool room he must also be a good tradesman. Other characteristics are technical skill, initiative, economic mind, hard worker, dependable, ability to follow up things, temperance, not hot-tempered, a keen understanding of discipline and good order, etc.

Workers who are trying to prepare themselves along these lines should be given the assurance that they have a chance to be foremen on their own merit, but not by common action.

Now, if a new man is to take Al's place I don't think his men are well enough educated to be a better judge in this matter than management itself. If they had a trained mind like Ed or Al, it would be different. If the men are given an opportunity to influence executive matters of this kind, they would suggest their stewards or an easy-going foreman who probably did not have the broad outlook nor the skill necessary for leadership. A foreman should be picked that is favored and respected by the majority of the workers, but this I think the management is more capable to do than the men.

I wonder how many of us that have advanced beyond the position

"Wrong number—he wanted to speak to someone in authority around here."

THE year has been good to us—as we hope it has been to you—and in appreciation for all its blessings we pause from concerns of business to extend to our customers and friends the old but sincere double wish—

Merry Christmas
and
Happy New Year

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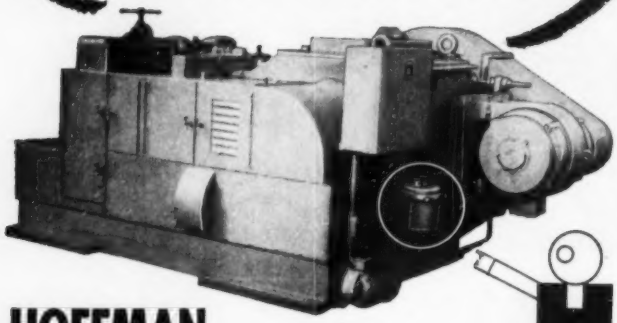
ABRASIVE CUTTING WHEELS

FOR BETTER OIL CLARITY —MORE ECONOMY



HOFFMAN DISC FILTERS NOW STANDARD on this Waterbury Farrel Hipro-Header

Despite a 10 to 1 difference in first cost, over previous filters, Hoffman Model I-6-15D Disc Filters proved more economical for Waterbury Farrel Foundry, builder of this high-speed Hipro Header.

Built to head bolts, screws, rivets, etc. from stock up to ⅜" O.D., this machine has a capacity of 115 units per minute. Extensive tests revealed that operation with the Hoffman filter meant greater lube oil clarity and longer filter disc life — thus, greater operating economy for the purchaser.

Hoffman disc filters have cleanable discs. Filtration at operating pressures up to 150 psi is accomplished without moving parts. Low maintenance cost. Write for Bulletin A669 for complete details *now*.

The I-6-15D

The I-4-15D

Hoffman Disc Filters, furnished in three sizes, may be installed singly or in units, to provide continuous clarification. Compact design for installation where space is limited. The I-4-15D delivers 1 to 10 g.p.m.; the I-6-15D provides 5-50 g.p.m. and the I-6-90D, 50 to 125 g.p.m. For the correct filter size for your requirement, Hoffman filtration engineers are at your service.

The I-6-90D

FILTRATION DIVISION U.S. HOFFMAN MACHINERY CORPORATION
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CANADIAN PLANT CANADIAN HOFFMAN MACHINERY CO. LTD. NEWMARKET ONT.

of foremanship believe that the average worker in Al's shop is so educated that he really understands what is at stake for the company when picking a foreman? It can't be many. Those who have enough experience of labor unions and their methods should know that many of its members have an entirely too adverse attitude towards their employer to consider their opinion of much value when selecting a foreman. On the other hand the best skilled workers would try to prevent the selection of a man who they knew was good for nothing but able to talk a lot of hot air. This is probably what happened if they had been asked to cast a vote for or against the foreman in the drill department.

I don't think there is anything for management to gain by workers having a say in the selection of their foreman. If the employers in the future are to have anything to say about their own enterprises they must conserve their right to lead and divide the work among their employees without undue interference.

A. E. Fristedt
Stockholm, Sweden

•

SHOT IN THE ARM

MANY MEN are asleep and they don't know it. It takes only a whisper to wake up some of us, and for others it takes an explosion or earthquake. Some will do something and will not be able to go to sleep for a long time; others just turn around on the other side and continue to sleep. That applies to supervision also.

When a foreman or anyone in supervision is wide awake himself his men do not need a shot in the arm. Everyone in his organization is doing the job that is assigned to him, and then if they work as a unit without lost motions, not playing or telling jokes instead of working, they not only work but they keep their benches clean and their tools in place.

In fact a wide-awake foreman trains his men to have a place for each tool and sees that the tools are in their places all the time when they are not used. That applies also to parts and material. Nothing is cluttered up so that the men are to be reminded or that the men have to have, every once in a while, a good scolding or a shot in the arm to wake them up.

Many times a wide-awake foreman or supervisor will, when visiting another shop or attending a lecture of an engineering society or reading

Performance Records JUST DON'T HAPPEN

Performance in any product begins with the manufacturer's policy. Here at Federal we are concerned only with producing Federal resistance welders and Warco presses that will deliver satisfactorily year in and year out. All Federal machines are designed for simplicity of operation and maintenance, and ruggedly built for the long haul.

If you now have a Federal Welder or a Warco Press in your plant check your performance records . . . we think this will prove our point. And, if you are not now operating a Federal or a Warco, and are contemplating the purchase of new equipment, listen to the Federal story . . . it will pay you in long-term performance, less down time, higher production and lower maintenance costs. Federal representatives in principal cities.

Federal WELDERS

THE FEDERAL MACHINE & WELDER COMPANY
WARREN, OHIO

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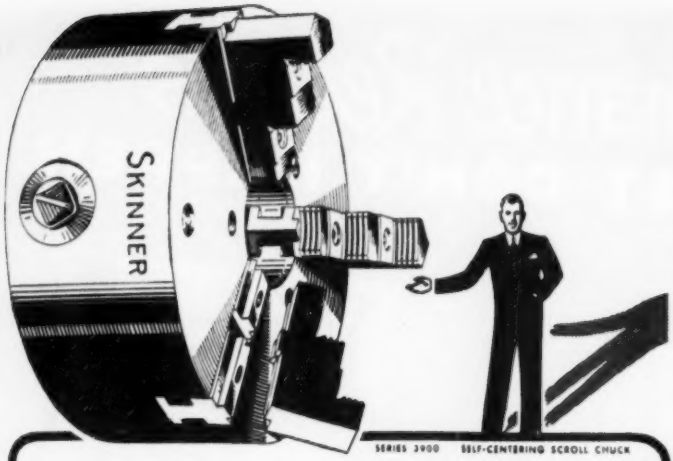

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SKINNER 3-JAW SCROLL Chucks

LARGE in VALUE..

LONG in LIFE...

BIG in QUALITY...

LARGE IN VALUE... because Skinner 3-Jaw Self-Centering Scroll Chucks are made with the most modern machines and by the most modern methods—there is more for your money in Skinner Chucks because accuracy is built in to last.

LONG IN LIFE... because every moving part is made of alloy steel, properly heat-treated, then ground to gage—and every moving part is grease lubricated from a single Alemite fitting. Interchangeability is a "must" in every Skinner Chuck.

BIG IN QUALITY... because, for 61 years, Skinner has provided chucks to meet the latest machine tool requirements. Skinner quality starts with modern design and makes itself evident in every step of construction. There are no better chucks made.

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"THE CREST OF QUALITY"

SKINNER CHUCKS

HAND & POWER OPERATED MACHINE CHUCKS—AIR CHUCK EQUIPMENT
—FACE PLATE JAWS—MACHINE VISES

magazines, come across an item that will stimulate his mental progress. Then he goes to his men and tells them what he has read or heard or seen that may help them in their job. Then the men will surely appreciate that kind of shot in the arm and they in turn will try to do more for such a boss that considers them as an equal and tries to pass on to them his knowledge.

If we have an active mind we can pass it to any men only by working with them, not having them work for you. Yes, Ed, give your men a shot in the arm, not once in a blue moon but often, not as you did, but work with them and train them to work with you, not for you. When you see that one of your men does a good job give him a pat on the back and do it so that the other men should see it. See that higher supervision knows it, and demand that they should also analyze the good work and give the men credit, perhaps a little cash, which is appreciated better than credit. That kind of a shot in the arm will go a long way.

Michael Axler
New York

•

ANY foreman to be successful also has to be consistent. These sudden spasms of socalled efficiency are silly and stupid and the men are the first to recognize the fact. It is a fact that any intelligent engineer could go into the majority of machine shops and find several reasons for not only cracking down on some of the fellows but also the foreman. And that is I believe partly why a foreman's job is so interesting. There is never a dull moment.

It is worse than useless for a foreman to crack down suddenly on several fellows for an infraction of such a minor nature as the reason Ed concocted with regard to Harrison-Madison & Hoyer. Each reason was very trivial, and the fact is that if the Madson bench had consistently been dirty, Ed has been neglectful on his part for not bringing Madson's attention to it.

Any intelligent foreman could and would have taken them in his stride as part of the day's work. The blueprint Hayes ruined of course might cause a little trouble, but a machinist doesn't ruin blueprints purposely. He might have been careless, but if he was a man who usually was careful and efficient Ed could have just requested he be more careful in the future.

Needling is an admission of failure of the foreman. Things are not

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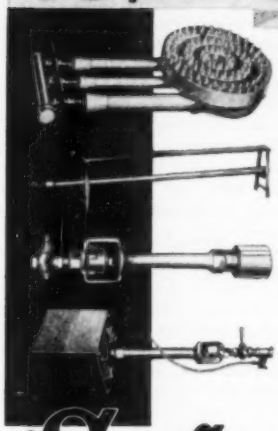

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Atmospheric
GAS BURNERS

Ring Burners
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Torch Burners
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Back in 1888, Kempsmith was a byword for America's supremacy in milling machines . . . pioneering and perfecting many new machines vital to industry. Today, Kempsmith's matured experience continues to loom soundly on the industrial horizon. You see it in the —

New
KEMPSMITH LH MILLER
— a rugged, yet lightweight milling machine, designed by Kempsmith Engineers for the many "in between" milling jobs. It bridges the gap between low range hand millers and big, expensive machines . . . combines sound, rigid construction with flexibility and versatility. It's ideal for small and milling, high speed jig boring, keyseating, oil grooving, light straddle milling, etc. Ask for Bulletin No. 127.

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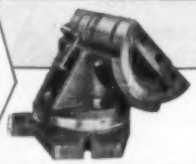
KEMPSMITH
• Precision Built Milling Machines Since 1888 •

BOSTON UNIVERSAL ANGLE PLATE

A Precision Tool that Holds Work at Any Desired Angle.



Puts Speed and Profit into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Made in several stock sizes.
Write today for full information.

US AUTOMATIC BOX MACHINERY CO., INC.
40 ARBORETUM ROAD • BOSTON 31, MASSACHUSETTS

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PRESS-RITE

OPEN BACK—INCLINABLE

POWER PRESSES

in your 1951 BUDGET NOW!

IN WAR OR PEACE . . . you get better results with PRESS-RITE open back-inclinable Power Presses because you get more advanced press engineering and more up-to-date operating features. Thousands of plants are now using PRESS-RITES. Repeat orders prove genuine satisfaction.

FOR
BLANKING
PUNCHING
DRAWING
FORMING
STAMPING

PRESS-RITE POWER PRESSES give you more day-in and day-out production . . . step up operator output . . . reduce costs . . . provide maximum safety. Greater shut height permits use of bulkier dies. Rugged construction assures long life. Yes, PRESS-RITES have more proved features than any other press of equal capacity. Write today for new bulletin No. P-650 and put PRESS-RITE PRESSES in your 1951 budget!

Also available in back-geared models.

WRITE TODAY for new PRESS-RITE PRESS Bulletin. Illustrated are Non Repeat Single Stroke Safety Mechanism . . . Automatic Cam Actuated Brake . . . Four Point Sliding Key Clutch . . . Unicast Frame . . . and many other features, and specifications.

Sales Service Machine Tool Co.

PRESS RITE PRESSES · SHAPE RITE SHAPERS · KELLER POWER HACK SAWS

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going too good for him either because he is not competent himself or some other reason and he starts to take it out of the fellows he supervises. Many good men have just got another job and quit, purely because they had a foreman who, like Ed, took to needling them for petty little things that a busy, efficient foreman would never have the time to bother his head about. It is not because he doesn't notice infractions; he has more important things to do and think about.

The needling routine doesn't keep men on their toes, it just makes them dissatisfied and restless. Teamwork would be impossible, and you can't inspire men to give of their best. They look for cheerful leadership and personal help from their foreman and not constant fault findings about tiny little shortcomings on their part. I can well imagine someone of his men along the shop shouting to the fellows. "Hi gang, here comes the old grouch again. Wonder who is next to be spanked?"

What a monotonous job a foreman would have if every man and machine was perfect and there were no Harrisons, Madsons, or Hayes to enliven the atmosphere, and bring a smile to make the day seem a little more enjoyable and relieved of the monotony of the daily grind. So my advice to you, Ed, is to seriously take stock of yourself in relation to your job. Are you running your toolroom as efficiently as you know how? I don't think so. You probably have 25 or more toolmakers, and if you are constantly on the lookout to improve the effici-

"Hmm! No tonsils"

ency of the department, a little personal help or advice, checking the faulty equipment of which there is always a little in every shop, and tending to all the little details that are a part of every foreman's job, you will find the day is not long enough to do everything that should be done and you will not have time to bother your head with needling anybody. The gang will be happier and you will be a success as a foreman.

Arthur Silvester
Niantic, Conn.

NEW BOOKS

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE (9TH EDITION). *Published by The Lincoln Electric Co., Cleveland 1, Ohio. 1200 pages. Price $2 in U. S., $2.50 elsewhere.*

Completely re-edited and reorganized to bring all information up to date, this new edition also includes new design data for manufacture of welded machines and structures. Latest procedures are presented for welding all metals and alloys with manual, semiautomatic and automatic processes.

The section on structural design has been enlarged and revised to include more information on welded rigid framing, and a new chapter has been added on weldability. This latter gives the facts which have changed welding procedures on many metals in the last few years. The machine-design information now includes additional material on the welded design of machine tools, and a new chapter has been added to present the fundamentals of welded design for machinery and structures.

•

HEAT TREATMENT AND PROPERTIES OF IRON AND STEEL. *By Samuel J. Rosenberg and Thomas G. Digges. Published by National Bureau of Standards, U.S. Dep't of Commerce, and available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C. 33 pages. Price $0.25.*

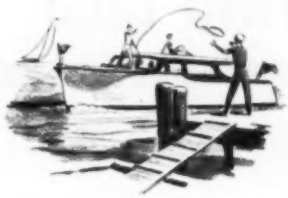
Presenting basic theoretical and practical principles involved in the heat treatment of ferrous metals, this circular has been prepared in simplified form to give an understanding of

SAVE SANDING COSTS!

How Production-Wise Manufacturers Save Time and Money with AP JEWEL ABRASIVES

ON LAND

The gleaming stainless steel that makes up these modern truck trailer bodies is polished with BONDITE* Jewelox paper belts. Because they cut faster, last longer, Jewel Abrasive Belts can roll up sanding savings for you, too!



ON THE SEA

Torn covers on drum sanders were causing costly slow-downs in finishing plywood sheets for this boat builder. AP Sales Engineer recommended change to super-tough Jewel Bondex Garnet Fibre. Builder reports, "These Jewel drum covers are the best we've ever used!"

IN THE AIR

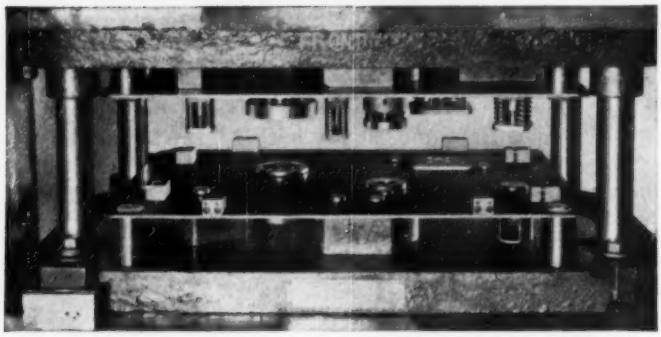
The stainless steel "skin" of a modern airliner needs careful sanding before final buffing operation. This steel manufacturer supplying the aircraft industry found that AP's special BONDITE* Jewelite paper belts cut faster, lasted longer than previously used abrasives.

*Moisture repellent and heat resistant.

Like to see sanding savings like these in your own plant? Whatever your product, chances are you can cut costs — do better work — with AP Jewel Coated Abrasives. See your distributor or write us.

Abrasive Products, Inc.

SOUTH BRAINTREE 85, MASSACHUSETTS • MAKERS OF JEWEL COATED ABRASIVES



● Magnetic Perforating Die set-up in small inclinable punch press.

Magnetic PERFORATING DIES

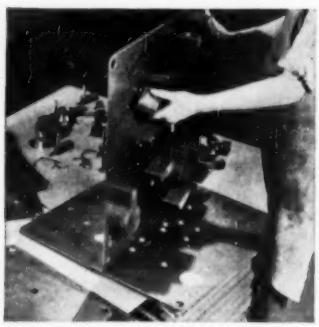
NEW and FAST Method for perforating Sheet Metal

SAVE PRESS DOWN TIME. Approximately 15 minutes required to change from punching one subject of say 20 holes to a different 20 hole arrangement. Whistler Magnetic Perforating Dies *increase* press production.

HOLD CLOSE TOLERANCES. Hole centers may be held to .0005" accuracy or as close as can be jig bored.

GREATER PUNCH AND DIE LIFE. Concentricity of punch and die assured thus giving uniform clearance around punch, increasing punch and die life.

SAVE FLOOR SPACE. Die storage cut to a minimum because only the 2 locating templets are stored...all that is required to duplicate the set-up.



● Die retainers complete with bushings being inserted in die templet.

REDUCE DIE COSTS. Whistler Magnetic Perforating Punch and Die units are used repeatedly for different hole arrangements. When completing one job, remove all units from templet and put them into service on the next different set-up. Combine any number of hole sizes and shapes. Punch and die costs are amortized over continued reuse in many jobs.

Write for Catalog...

Whistler Magnetic Perforating Punches and Dies have proven their cost-cutting advantages in many prominent plants. The catalog shows how. Send for it today.

S. B. WHISTLER & SONS, Inc.

758 MILITARY ROAD, BUFFALO 17, NEW YORK

heat treatment to those unacquainted with the subject.

The effects of various treatments on the mechanical and structural properties of iron and steel are discussed in simple terms. Subjects include properties of iron, alloys of iron and carbon, decomposition of austenite, heat treatment of steels and cast iron, hardenability, nomenclature, recommended heat treatments, and properties and uses of steels. Copiously illustrated with photographs, tables, and graphs.

•

A. S. M. E. MECHANICAL CATALOG AND DIRECTORY—1951. *Fortieth annual edition. Published by The American Society of Mechanical Engineers, 29 W 39th Street, New York, N. Y. 645 pages. Available free to members of A. S. M. E. only.*

Included are up-to-date catalogs of manufacturers of mechanical parts and equipment, a directory of sources of machinery, equipment, and supplies, a list of trade names with the names of companies using them, and a catalog on A. S. M. E. codes, standards, and publications.

Manufacturers' catalogs are arranged alphabetically by company name, and the directory section is arranged alphabetically by generic name of products.

•

SCHRAUBENHERSTELLUNG (PRODUCTION OF SCREWS)—*by Ernst Lickteig. Published by Verlag Stahleisen M. B. H. Dusseldorf, Germany. 240 pages. Price 26 Marks.*

Text in (second edition) German language covers the history of nut and bolt manufacture, stresses in nuts and bolts, testing materials and finished screw products, and manufacturing methods. There are ample illustrations and 11 tables. Useful material on production methods and the machines used in production is presented. Generally, the book would be useful to students and young engineers.

•

A MANUAL OF PLASTICS AND RESINS—*Edited by William Schack. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. 550 pages. Price $10.00.*

This is an encyclopedic roundup of basic data, definitions, explanations

HOW STRESSPROOF CUT COSTS on these 4 products

	SPLINED SHAFT FOR CLUTCH	WASHING MACHINE GEAR	ADJUSTING SCREW	KING PINS
STEEL REPLACED	4140	C-1117 CASE-CARBURIZED	ANNEALED A-1335 HEAT TREATED	C-1019 CASE-CARBURIZED
OPERATIONS ELIMINATED	FULL HARDENING (@ $1.25 to $3.75 PER SHAFT) STRAIGHTENING	CARBURIZING (@ $140 PER TON) FINAL CLEANUP GRIND	HEAT TREATING STRAIGHTENING	CARBURIZING SECOND PASS IN GRINDING
OTHER BENEFITS	REJECTIONS (FORMERLY UP TO 20%) REDUCED TO APPROX. ½ OF 1% MACHINABILITY UP 20%	PRODUCTION INCREASED 100%	PRODUCTION INCREASED 150% REJECTIONS PRACTICALLY ELIMINATED COSTS CUT 33%	TOTAL SAVINGS 25%

Provides 4 in 1 IN-THE-BAR QUALITIES

This unique, cold-finished carbon-steel bar cuts costs sharply because it has all four desired qualities *in-the-bar* . . . Strength . . . Machinability . . . Wearability . . . Minimum Warpage. With STRESSPROOF, no heat treating is required—its in-the-bar strength is double that of ordinary cold-finished shafting. Its machinability is 76% of B-1112—fully 50% better than heat-treated alloys of the same hardness. Its resistance to wear as machined is sufficient to replace many heat-treated or carburized steels. Being stress-relieved, it has a minimum of distortion. Investigate STRESSPROOF'S money-saving possibilities. It costs little more than ordinary cold-finished bars. Available in cold-drawn or ground and polished finishes.

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La Salle* STRESSPROOF®

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*Manufacturer of the Most Complete Line of Carbon and Alloy Cold-Finished and Ground and Polished Bars in America

SEND FOR FREE ENGINEERING BULLETIN

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Please send me your STRESSPROOF Bulletin.

Name_____

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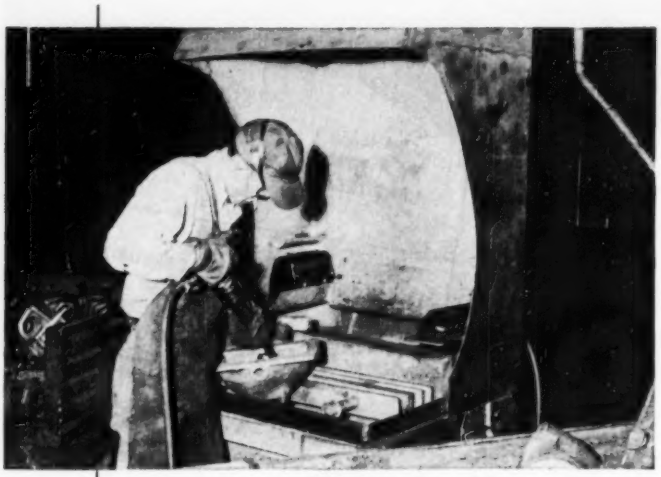
Workers get Clean Air and Clear Vision with ROTO-CLONE Dust Control



THEY don't "let the chips (and dust) fall where they may" in this foundry. Pictured here is a modern down-draft chipping booth which is served by an AAF Type D Roto-Clone.* Chips and dust are drawn off as fast as they are generated. Worker comfort is vastly improved and he has a clear view of the job at all times.

No matter what you grind or how you grind it, a Type D Roto-Clone will give you positive dust control. This compact, self-contained unit combines the functions of both exhauster and separator. All operations—drawing in the dust-laden air, separation of dust, delivery of collected material to storage hopper and expelling the clean air—are performed by one moving part.

You don't have to rearrange and disrupt your grinding operations to take advantage of Roto-Clone dust control. The Type D may be installed as a central type with main dust and branch connections or as an individual unit serving a single dust-producing operation. For complete information, call your local AAF representative or write direct to

*Roto-Clone is the trademark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator types

AMERICAN AIR FILTER COMPANY, INC.
207 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P.Q.

AAF
ROTO-CLONE®
DUST CONTROL EQUIPMENT

of processes, listings of properties, and trade names and manufacturers of plastic and resinous materials. Gathered with the cooperation of the Society of the Plastics Industry, articles are written by practicing engineers and chemists in the plastics industry, and each contributed articles carries a byline.

Organization of the reference book is alphabetical, by generic name of material, process, piece of equipment, product, etc. The book is intended mainly as a reference for those not too familiar with chemical processes, although it will serve as a quick reference for engineers and chemists, as well.

•

ELECTROPLATING JOB SHOP. *Published by Office of Technical Services, and distributed by Office of the Publication Board, Dep't of Commerce, Washington 25, D.C. 12 pages. Mimeograph. Price $.25. File No. PB 99147.* Intended primarily for the man who contemplates setting up a small electroplating jobbing business, this pamphlet warns of some of the difficulties that may beset the tyro, and gives sound practical advice on how to proceed. It outlines the type of equipment needed for both a small chrome plating and a small general plating shop, and gives a brief description of the various processes involved. Two suggested plant layouts are given, as well as an estimate of the cost, and a list of equipment and supplies.

Budgetary Controls Chart the Course to Profits

THREE MAJOR CONTROLS that management should follow closely were outlined by H. H. Whitmore, treasurer and general manager, Jones & Lamson Machine Co., at the Fifth Annual Time Study and Methods Conference at the Hotel Statler, New York.

Whitmore noted that management is "in a spot where it must have improved controls that will give better information as a basis for making policy decisions" and pointed to standards and budgets as one of the best means to this end.

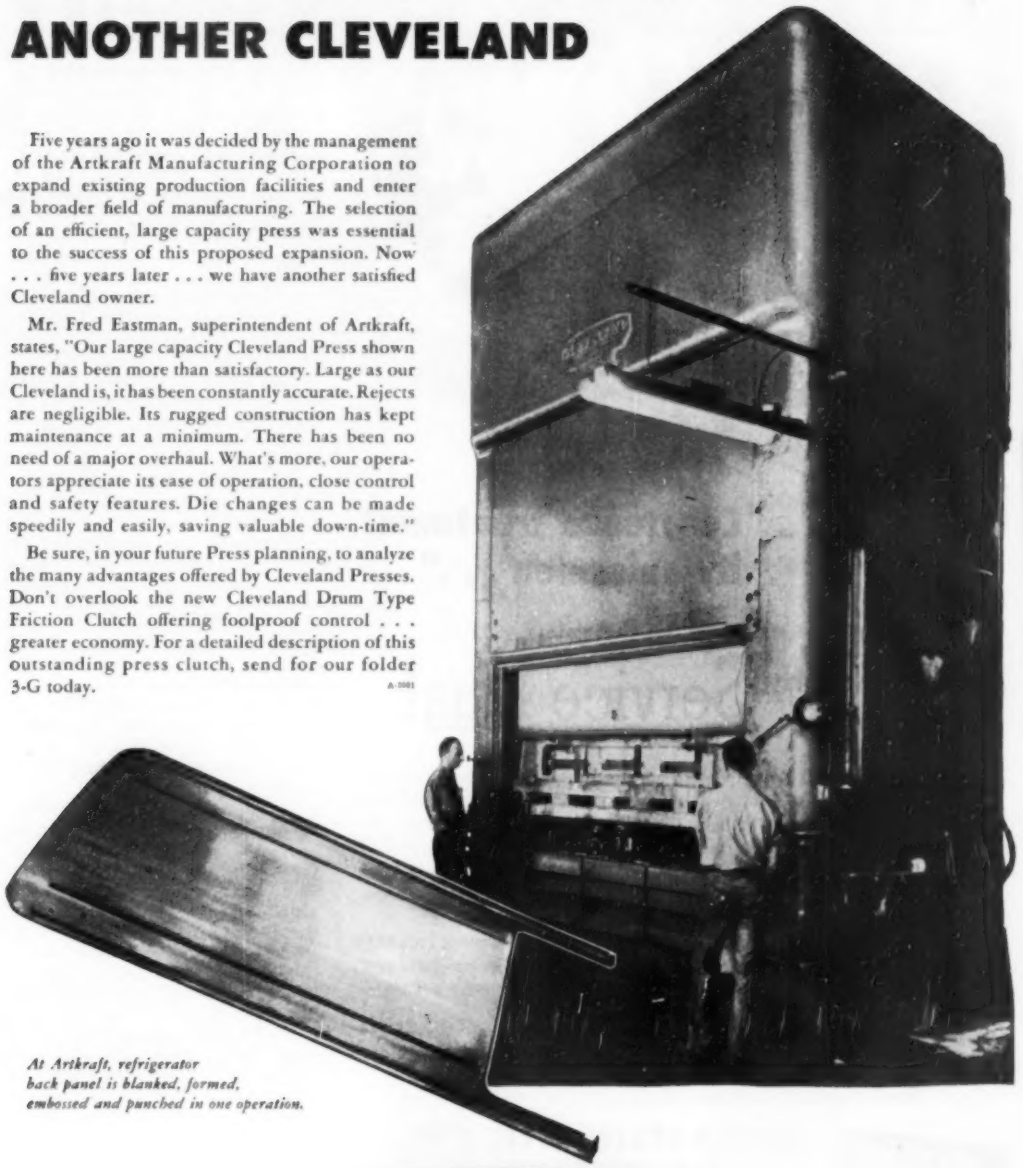
"Prior to the beginning of each fiscal year, an over-all company budget should be prepared. The starting point is to estimate total sales for the period. Sales budgets by districts and products should be submitted to the sales manager for review and adjustment where advisable. Estimated sales for the entire

ANOTHER RIGHT CHOICE...
ANOTHER CLEVELAND

Five years ago it was decided by the management of the Artkraft Manufacturing Corporation to expand existing production facilities and enter a broader field of manufacturing. The selection of an efficient, large capacity press was essential to the success of this proposed expansion. Now . . . five years later . . . we have another satisfied Cleveland owner.

Mr. Fred Eastman, superintendent of Artkraft, states, "Our large capacity Cleveland Press shown here has been more than satisfactory. Large as our Cleveland is, it has been constantly accurate. Rejects are negligible. Its rugged construction has kept maintenance at a minimum. There has been no need of a major overhaul. What's more, our operators appreciate its ease of operation, close control and safety features. Die changes can be made speedily and easily, saving valuable down-time."

Be sure, in your future Press planning, to analyze the many advantages offered by Cleveland Presses. Don't overlook the new Cleveland Drum Type Friction Clutch offering foolproof control . . . greater economy. For a detailed description of this outstanding press clutch, send for our folder 3-G today. A-3001



At Artkraft, refrigerator back panel is blanked, formed, embossed and punched in one operation.

THE CLEVELAND PUNCH & SHEAR WORKS CO. USA

Established 1880

PUNCHING TOOLS & DIES

FABRICATING TOOLS

POWER PRESSES

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PITTSBURGH

CLEVELAND 14, OHIO

company are then presented to the general management committee and the final budget is approved in total and by districts and products. This, then, becomes the standard of output for the sales department.

This is only half the equation, however. A standard must be set in the form of a cost budget by districts and total. A careful study is necessary to determine the cost of obtaining the estimated business. The amounts agreed upon must be expressed not only in dollars but also in percentages. Here are the two financial standards (budgets) for management to watch when gaging the efficiency of its sales organization. The percentage of costs to sales is most enlightening. It will indicate at any level of incoming business the actual cost efficiency in comparison to the predetermined and accepted cost efficiency as reflected by the budget. Too often the sales-cost ratio is neglected. Business at any cost is a poor slogan. Submarginal sales effort should be eliminated as should all unprofitable activity throughout the concern.

"With our sales quotas fixed by products and total, we have defined the task of our production department. We can now determine the direct laor hours necessary to produce the articlbes which the sales department has agreed to sell. For simplicity, I will assume that inventories are to stay the same. Using the previously determined time and quality standards, it is a relatively simple task to establish the number of direct hours required.

"Performance of the operators against standard has a great bearing on the necessary productive hours. Often it is safer to use a performance slightly lower than the recent actual and thereby be pleasantly surprised than to try and figure to the last hour and be disappointed. A simple but effective gage can be obtained by dividing the direct labor hours into the sales dollars produced to get the sales value of each direct-labor hour. Periodic checks can readily be made to determine whether or not the direct worker is producing the standard number of sales dollars.

"I have already touched briefly upon the ever-present and worrisome item of indirect labor. The simplest and quickest way to keep informed on this subject is to record indirect hours as a ratio to direct hours. We already have our control figure of direct hours. We must now determine the number of indirect hours per item necessary to properly service the direct hours. Here again

"Courteous treatment by salesmen . . ."

that's only one of the things we mean by Service Plus!

A recent survey of our customers impressed us again with the fact that "a company is only as good as its personnel!" Many customers told us that they like to do business with United States Steel Supply Company because of the courteous attention they receive from our salesmen. We're glad their efforts are appreciated and we assure you that every order you place, large or small, will receive prompt, courteous attention from men who know their business.

Service Plus is our pledge to handle your order as you want it handled. Our capacity to serve you includes a diversified line of steel products and years of experience in providing the most complete steel service available.

U-S-S Carilloy Alloy Steels Manufactured to a Guaranteed Minimum Hardenability
HOT ROLLED AND COLD FINISHED BARS · PLATES · STRUCTURALS · SHEETS
STRIP · STAINLESS · ALUMINUM · TOOLS · SUPPLIES · MACHINERY

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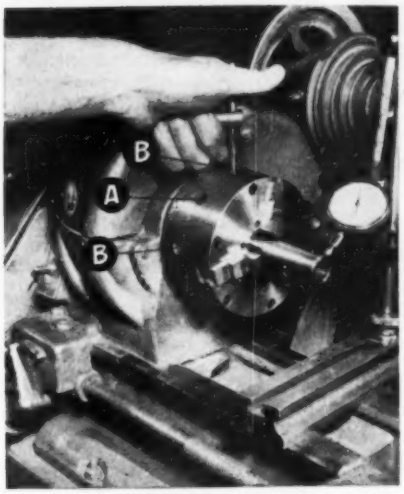
UNITED STATES STEEL

THE MOST VERSATILE CHUCK YOU CAN BUY!



Buck AJUST-TRU CHUCKS

NEW DESIGN PRINCIPLE

1. **Gives .0005 precision with scroll chuck rechucking speed!**
2. **Performs collet and step-collet operations!**
3. **Ends most needs for stub arbors and mandrels!**
4. **Compensates for spindle run-out—lengthens useful life of old machines!**
5. **Can be adapted to dividing heads, grinders, screw machines!**

FIRST REAL CHUCK ADVANCE IN 50 YEARS!

If you know chucks you will quickly see why the Buck Ajust-Tru is such a revolutionary advance, though the operating principle is simple. Pinion "A" moves jaws in or out to grip work like any scroll chuck. 4 opposed screws "B" bring the work to dead center. It's as easy as it sounds. (Men who have never used chucks before have centered work within .005 in 3 minutes!) Once set dead true the same machining on duplicate parts (from two to hundreds) can be done without changing adjustment!

Now, for the first time, you can figure the chuck as a time-saving member of your production team. Buck Ajust-Tru chucks bring you new speed in setting to dead true, *plus* spindle collet capacity from ⅛" to 1½" by .001, *plus* step-collet capacity of ⅛" to 5" by .001 (on 6" chucks). Buck chucks—at ordinary scroll chuck prices—do the work formerly requiring from $250 to $1,000 in special equipment, and do it with equal or greater precision in much less time. We know it's hard to conceive of a chuck being that good but reserve your judgment until you send for literature.

3 STEP-JAW CHUCK

Now you can get 3 jaw scroll chuck speed with .0005 precision. 3 sizes—4", 5", 6".

6 STEP-JAW COLLET CHUCK

Brings work into line without danger of cocking, grips soft metals and tubes with less pressure. 4", 5", 6".

6 JAW PRODUCTION COLLET CHUCK

Has many superior features over collets. Holds work firmer, permits precision machining farther from spindle. 4", 5", 6".

Buck AJUST-TRU CHUCKS

BUCK TOOL COMPANY
1210 Schippers Lane • Kalamazoo, Mich.

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE ROUNDS, SQUARES, FLATS, HEXAGONS

even tempered, but TOUGH!

HY-TEN "B" No. 3X

If you need even temper and toughness on heavy-duty parts, by all means investigate the unusual properties of HY-TEN "B" No. 3X!

WL can supply "B" No. 3X in bars, discs, flats or forgings heat treated to your exact hardness specifications. And this unusual HY-TEN alloy steel can be machined even when hardened as high as 477 Brinell (48 Rockwell "C")!

This unusual property—*machinability at high degrees of hardness*—makes this steel particularly well suited for parts which are apt to distort badly in the treating operation. This makes possible savings in handling and set-up time and finishing operations by putting parts into service without further treatment. A smoother finish is obtainable at almost any degree of heat-treated hardness than is possible with standard alloy steels.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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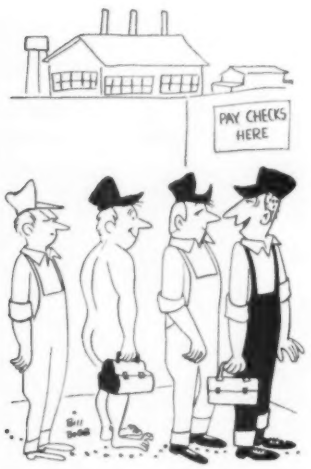
HY-TEN and AISI

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

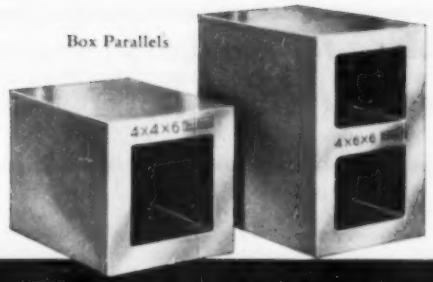
the pre-established indirect standards for time and quality enable us to set the amount of indirect work necessary to accomplish our goal. Each indirect item should also be expressed as a percentage of the total direct hours. We now have a standard not only in hours but also in percentage which figures clearly express the desired results.

"In addition to furnishing management with the predetermined figures, the actual accomplishments should be shown on the same sheet. First, record the actual total direct hours against the standard and, second, the actual indirect hours against each individual standard for each item. The actual figures should also be expressed as a percentage of the total direct hours. These percentages will show at any level of direct hours whether or not the indirect hours are being controlled within the limits of the established standards. Unless the standards are being met or improved, it automatically follows that the desired profit will not be recorded when the final audit has been completed.

"If a man speaks of profit in this day and age, he is often looked upon with scorn. None of us should be ashamed of a profit. In fact, we should be ashamed if we do not make a profit. Profit is the foundation of our entire economy and unless business is permitted to make a justifiable profit and allowed to retain, under reasonable tax laws, a goodly portion thereof, our economy is due to fall by the wayside."

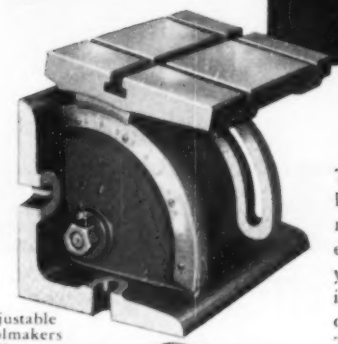


"That's Sam Benton. He'd give you the clothes off his back . . . uh! oh!"



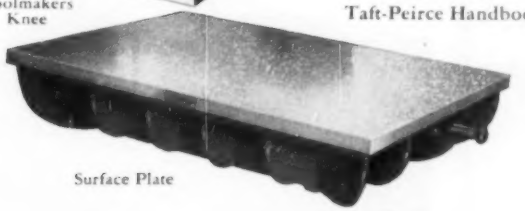
WHEN YOU WANT HIGHEST PRECISION

In Inspection and Production Tools



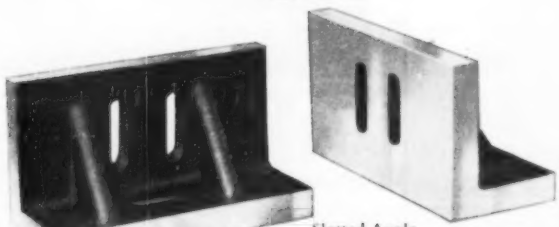
. . . Specify TAFT-PEIRCE

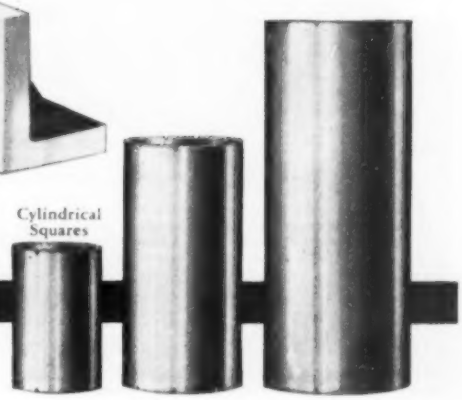
Taft-Peirce Inspection and Production tools are designed and built to the quality standards of the world's most famous toolroom. The finest grades of alloy steel, careful heat treatment, exact finishing produce unequaled precision — the precision you require to ensure true accuracy in your set-up, layout, and inspection work. For further information on these and many other aids to manufacture, write today for your copy of the new Taft-Peirce Handbook, just off the press.



The TAFT-PEIRCE Manufacturing Company

WOONSOCKET RHODE ISLAND





TP means TOP PRECISION

If you're looking for production improvement and lower costs...investigate M & N HYDRAULIC PRESSES

A TYPICAL CASE STUDY

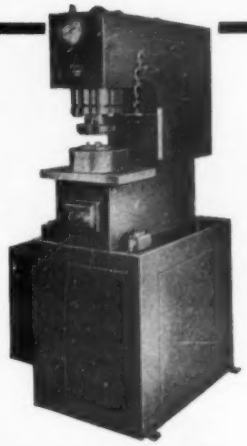
By substituting an M & N "C" Frame Press for ordinary hydraulic equipment, a manufacturer of buffing wheels stepped up production from 30 to 450 pieces per hour.

M & N Hydraulic Production Presses are extensively used for blanking, forming and drawing of heavy materials. They are also ideally adapted for use in the jewelry field and by silversmiths. In general, they eliminate the need of a drop hammer.

Important features of the M & N "C" Frame Press include compactness, power ram return, automatic reversal at pressure setting, rapid advance wih automatic changeover to slow pressing speed at full load. A control for reversing ram at any part of stroke regardless of pressure setting can be furnished as an extra, if desired.

In these presses, a double acting cylinder provides high speed power ram return of approximately 50% total press capacity pressure. Dies in blanking and drawing operations are easily broken loose.

Simple and completely self-contained, M & N Presses are available in capacities from 5 to 75 tons . . . optional controls available are: push button, manual control lever, foot operated valve or electric foot control switch.



Complete specifications sent promptly on request.

for full details WRITE

M & N MACHINE TOOL WORKS, INC.
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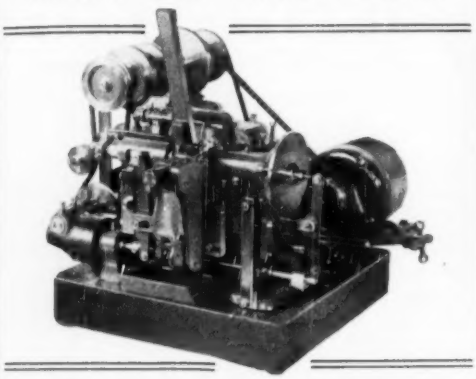
WALTHAM
PINION AND GEAR CUTTING MACHINES



Fast, Convenient, Compact, Accurate

Designed to make high speed production of small gears and pinions available for assembly in watches, instruments, gauges, fuses, etc. Made in Single-Cut, Multiple Cut and Magazine-Feed types. Simple to operate; require no special skill.

Send for detailed information and complete specifications.

WALTHAM MACHINE WORKS
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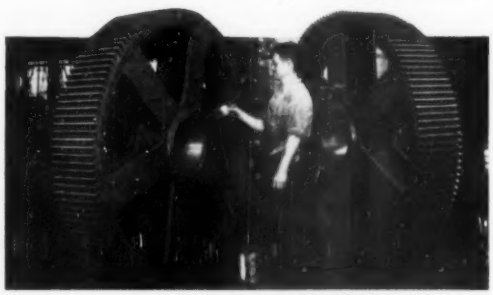
HEAVY DUTY GEARS *for Tough Jobs*



Ready for shipment, the H-arm spur gears shown above will see grueling service in mine hoists. Superbly constructed by Stahl craftsmen using the finest in precision equipment, as are all Stahl products, they will prove more than equal to the demands of the job. If it's gears you need, it will pay you to get Stahl's estimate first.

SPURS TO 72" PD, 1 DP
BEVELS TO 54" PD, 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP
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SILENT GEARS; RAWHIDE, BAKELITE, FABROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

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As far as we're concerned, nothing equals the importance of the man on the other end of an order.

Because, the degree of his satisfaction is the key to our future business success.

And, we know it.

That's why we have always made it a policy to give our customers exactly the kind of work they want. And, that's why we take an individual interest in every gear that leaves our plant.

We want the man on the other end of an order to have the utmost confidence in our ability to give him just the right gear for his purpose. A convinced customer will always come back for more. THE EARLE GEAR & MACHINE CO., 4707 Stenton Ave., Philadelphia 44, Pa.

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TO MEET *Your Specific* NEEDS!

Each Cincinnati Gear is made to fit a particular requirement from job specifications.

Cincinnati Gears, Good Gears Only, have the built-in accuracy and precision that make possible outstanding performance records.

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Rack • Worm • Bevel
Spline Shafts • Spiral
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• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the one gear suited for your job.

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MEMBER OF AGMA

UP TO 60" PITCH DIA.
UP TO 10" FACE WIDTH

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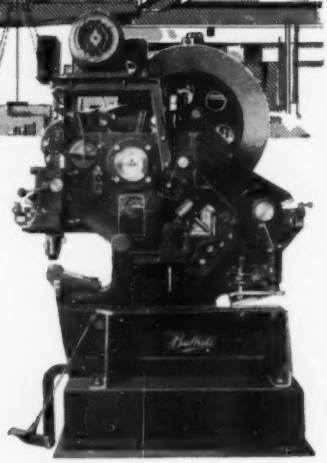
UNIVERSAL IRON WORKERS

• That's the reputation "Buffalo" Universal Iron Workers have earned in the shops of heavy industry and railway maintenance. Model shown can do FIVE operations without tool changes — THREE, SIMULTANEOUSLY! If you do heavy metal fabrication, you'll do it far cheaper with a "Buffalo" U. I. W.



- NOTCH • PUNCH
- 3 SELECTIVE DIAMETERS
- COPE SHEAR OR MITRE ANGLES
- SHEAR ROUNDS & SQUARES
- SPLIT PLATE OR SHEAR FLATS

Write for Bulletin 360-D for capacities and models available.

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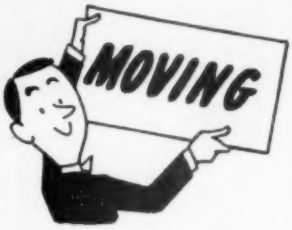

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On or about ..... my new address will be:

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City ..... Postal Zone # ..... State .....

Signed .....

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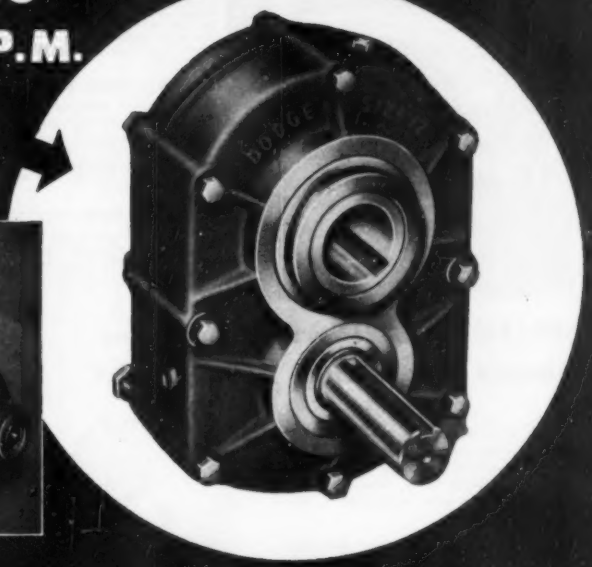
NEW!

A TORQUE-ARM SPEED REDUCER FOR SPEEDS 115 to 330 R.P.M.



A SINGLE REDUCTION SHAFT-MOUNTED SPEED REDUCER now offered by Dodge provides a wholly new opportunity for important savings on drive reduction where requirements for output speeds range from 115 to 330 r. p. m.

This new SINGLE Reduction Torque-Arm Speed Reducer provides the same big advantages in this range that its companion, the Dodge Double Reduction Torque-Arm, has brought to the field of lower speeds. Practical and economical. Easier to install and much more flexible in its application than floor mounted reducers. This new Dodge Single Reduction Torque-Arm can be delivered right from your Distributor's stock. Simply give him your horsepower requirement, the desired speed and size of the shaft to be driven, and he will furnish this complete speed reducer package to fit your job accurately.

Write us for Bulletin A602 with full details.

- ★ Four sizes...all available from stock with stock product economy...with capacities up to 27 H. P. and developing output speeds from 115 to 330 r. p. m.
- ★ Torque-Arm, fastened to floor or any fixed object, anchors reducer unit. Turnbuckle provides fast, accurate adjustment of belt tension.
- ★ No special engineering required. No foundation to provide. No flexible couplings or sliding base. No "lining-up" difficulties. Unit is driven through any V-Belt Drive.

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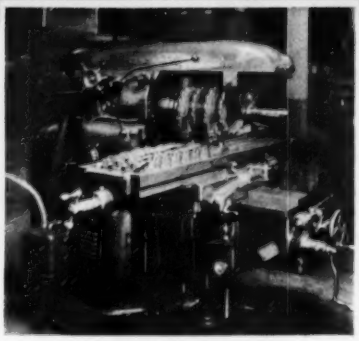
AMERICA'S MOST COMPLETE LINE OF SHAFT-MOUNTED SPEED REDUCERS

Here's how **NELCO** Carbide Tipped Tools

increased Production on this Chilled Iron Casting

OVER 60%!



Facing 4 surfaces of Chilled Iron Refrigerator Door Hinge on #3 Cincinnati milling machine — High Speed Steel Cutter vs. Nelco Carbide Cutter.

HIGH SPEED STEEL

Production — 50 pieces per hour.

Cutters needed frequent repairs.

Down-time increased production cost.

Rejected pieces were excessive due to chilled condition and hard spots in castings.

NELCO CARBIDE CUTTER

Production — 80 pieces per hour.

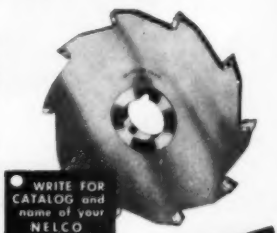
Resulted in continuous operating time and no rejected pieces.

Production increased more than 60%!

OBJECT: SAVINGS — When you change to Carbide Tipped Tools!

Chilled Iron, Steel, Brass, Bronze, Aluminum, or Alloys can be milled faster, better, more efficiently with Carbide Tipped Tools. There is a NELCO Cutter, Face Mill, Slab Mill to increase your production — cut your costs.

Remember: NELCO Tools are designed with nickel shim brazed carbide tips and alloy steel bodies. Investigate the many other NELCO exclusive advantages. Learn how your production costs can come tumbling down.



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For that Extra Edge in Production

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Get 30% MORE ENDURANCE 28% MORE STRAIGHT CUTS 5% MORE SPEED WITH TODAY'S

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SOLD THROUGH SELECT INDUSTRIAL DISTRIBUTORS

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The Advertising Research Foundation's first readership survey of a metalworking magazine reveals that 80 per cent of *American Machinist* readers with buying influence specify the make or brand of products they buy.

Make sure *American Machinist's* readers know *your* products . . . and the reasons why they can do a top-quality, low-cost job. *American Machinist's* 28,000 production-executive subscribers are a potent buying power in America's biggest industry.

Some still say:
"It can't be that simple"

To those who have struggled with shaft shoulders, lock nuts, adapter sleeves and other gadgets for holding a bearing to a shaft it is understandable why some still say: "It can't be that simple", when they see how easy a Fafnir Wide Inner Ring Ball Bearing with the famous Self-Locking Collar slides on and fastens to a shaft.

If you believe that "seeing is believing" try Fafnir Ball Bearing Power Transmission Units on your next installation. We'll let you judge for yourself.

To make it simple for you, a nearby Fafnir Distributor will supply the units best suited for your requirements. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR BALL BEARING POWER TRANSMISSION UNITS

Self-aligning. Sealed for long, uninterrupted service. A type and size for every condition.

PILLOW BLOCKS
Mechani-Seal Type. Two Series: Light and Heavy

PILLOW BLOCKS
With labyrinth seals, and single or double dirt guards. Two Series: Standard and Heavy

RUBBER MOUNTED UNITS
Pillow Blocks
Flange Cartridges

It's this simple

1
Slip it over the shaft.

2
Engage and turn the collar.

3
Set the screw.

that's all

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BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

FLANGE CARTRIDGES
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PILLOW BLOCKS Fixed and Floating Types. Two Series: Standard and Heavy

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With pressed steel flanges

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Bench Type

- All Steel Construction
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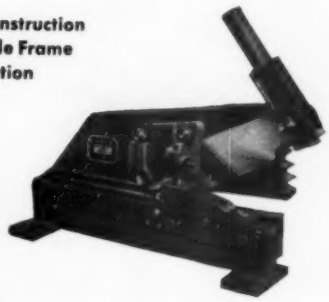

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Cuts sheet or plate up to	1/8"	3/16"	5/16"	3/8"
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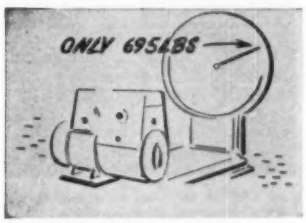

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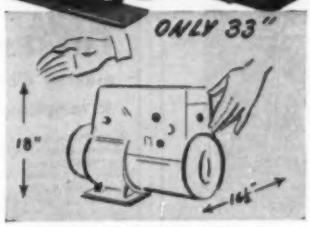
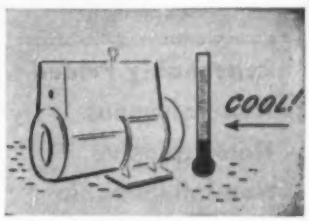


STURDY AND COMPACT Four sets of main brushes and one auxiliary set firmly fastened for good commutation. Simple design and rigid construction throughout . . . space-saving dimensions.



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● Stationary or portable mountings—Additional Features: single heat control; life-time sealed bearings; push-button start- and -stop switch with overload protection; high-low range switch; and polarity reversing switch. Get all the facts. Call your P&H representative, or send in coupon.

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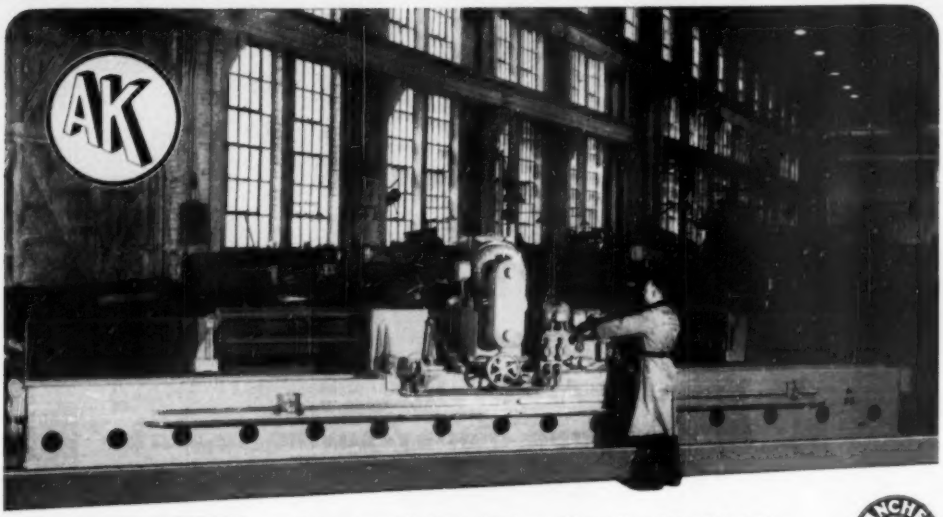

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Made by World's Largest Manufacturers of Shear Blade, Knife and Saw Grinding Machinery.
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KASENIT has behind it a long record of success—in leading automotive, aviation, railroad and other metal-working shops all over the Country. Its regular users include manufacturers whose names are household words throughout industry.

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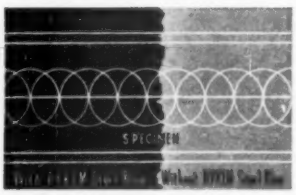

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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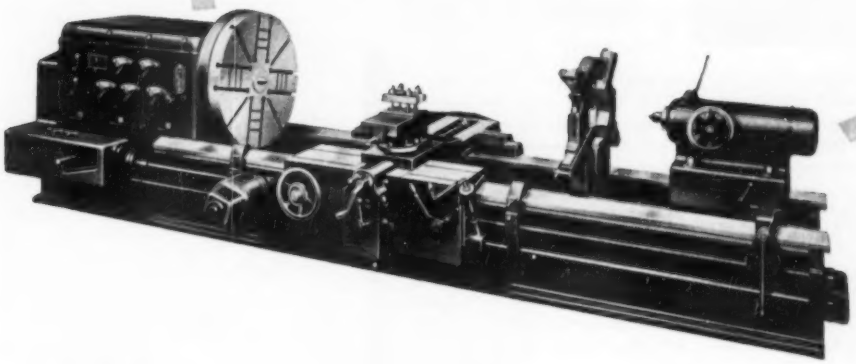
NEW NILES

Heavy-Duty Engine Lathe



Here's a new line of Niles heavy-duty engine lathes – improved in many important respects over the older famous Niles lathes. There are more antifriction bearings. Beds are heavier. Automatic lubrication is more extensive. All 56 feeds and threads are instantly available without changing quadrant gearing.

Range of sizes is from 40" to 80", and up.

All models have the extra margin of power, strength and rigidity which have made Niles machine tools so well known for maintained accuracy under heavy-duty operating conditions.

Full information on these new lathes can be obtained through Lima-Hamilton offices in New York, Chicago and other principal cities or by writing directly to Lima-Hamilton Corp., N. 3rd Street, Hamilton, Ohio.

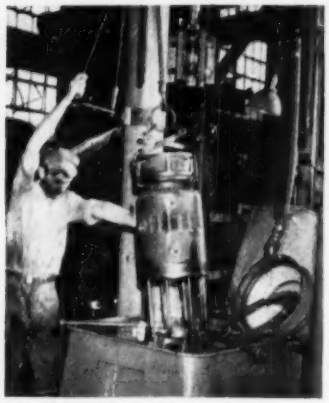
LIMA HAMILTON CORPORATION

NILES TOOL WORKS CO. **HAMILTON, OHIO**

A division of the Lima-Hamilton Corporation

Now! MAKE **ONE SOURCE**

RESPONSIBLE FOR YOUR HONING RESULTS



FULMER SUPPLIES

HONING MACHINES
Fourteen models cover diameters from 1/4" to 30". Strokes to 84".

HONING TOOLS
Alexander Ball Tools available in sizes to 50".

HONING FIXTURES

Why divide responsibility for the performance of your honing operations among several suppliers? Fulmer supplies a *complete honing package* — honing machine, tools and necessary fixtures—giving the user *one* source that *guarantees* best honing results!

Fulmer Honing Machines are engineered to give maximum production with minimum investment. They are known for rapid stock removal and extreme accuracy. Quick change over for various size jobs. The machines are simple to operate—easy to set up—many users have unskilled labor operating them efficiently.

Save on production time, cut costs and improve quality on finishing all classes of cylindrical bores with a *Fulmer Honing Package*—it offers the *greatest value* in the honing field. Write for Bulletin No. 10 and full details.

C. ALLEN FULMER CO. 1234 FIRST NATIONAL BANK BLDG., CINCINNATI 2, OHIO

High Carbon—High Chrome Steel Hardened Without Packing at DE LAVAL

Delaware simplified controlled atmosphere saves preparation and heating time on all steels at De Laval Steam Turbine Company, another Delaware Furnace user.

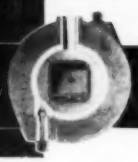
No work packing . . . no elaborate equipment . . . no wasted time. This one furnace does every heat treating job on every type of tool and alloy steel. Work is free from both scale and de-carburization.

YOU can *confidently* and *economically* heat treat in your own shop with the easy-to-operate Delaware Furnace.

INFORMATIVE DATA is in 16-page Bulletin F-1. Send for your copy.

DELAWARE TOOL STEEL CORP.
WILMINGTON 99
DELAWARE

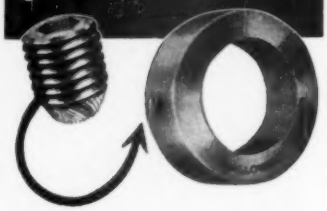
TANGENTIAL FIRING
Operating Range 1200 to 2800° F.



DELAWARE
Controlled Atmosphere
FURNACES

HALLOWELL

Steel Collars



HALLOWELL Solid Steel Collars, functionally proportioned throughout . . . precision-machined so faces run perfectly true . . . are beautifully polished all over . . . yet they cost less than common cast iron collars. 3" bore and smaller are made from Solid Bar Stock. To make sure the collar won't shift on the shaft, they are fitted with the famous UNBRAKO Knurled Point Self-Locking Socket Set Screw — the set screw that won't shake loose when once tightened. HALLOWELL . . . a "buy word" in shaft collars . . . available in a full range of sizes for IMMEDIATE DELIVERY.

Write for name and address of your nearest HALLOWELL and UNBRAKO Industrial Distributors.

STANDARD PRESSED STEEL CO.
JENKINTOWN 1, PENNSYLVANIA

DO YOU NEED HELP?

If you are in need of technical executives from Works Managers to Supervisors, an ad in the Classified Section of *American Machinist* will help you locate the men you need.

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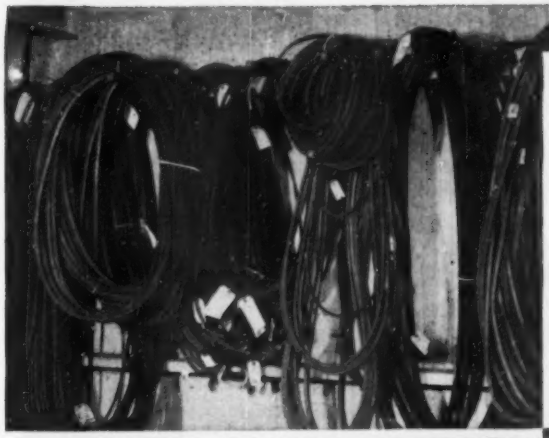
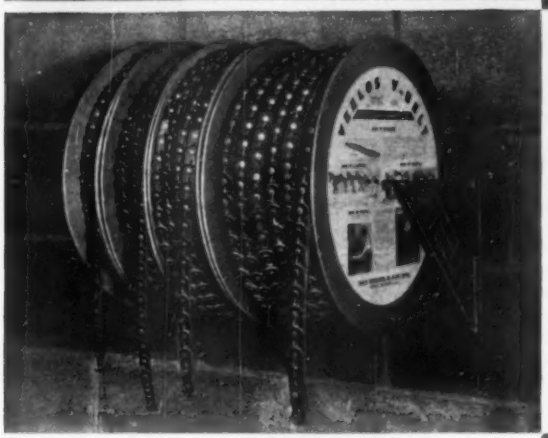


when you use v-belts, remember . . .

VEELOS CUTS COSTS ON V-BELT INVENTORIES

This large stock of endless v-belts is as unnecessary as it is costly and hard to keep under control. Switch to Veelos—the adjustable v-belt—and stop forever all this useless waste of time, space and money.



when you use v-belts, remember . . .

VEELOS IN STOCK MEANS ANY SIZE BELT IS INSTANTLY AVAILABLE

Just four reels of Veelos can take care of as many as 316 sizes—*every* v-belt need in the O, A, B and C widths. No cluttered stockroom, no control problem, no replacement difficulties when you standardize on Veelos in the widths you require.

when you use v-belts, remember . . .

VEELOS KEEPS MACHINES AT PEAK PRODUCTION

Veelos runs true for vibrationless, full power delivery. Veelos installs *quickly* and *easily*—and you never need to dismantle outboard bearings. Veelos can be simply adjusted to maintain uniform tension on all belts.

And, as a reminder . . .

Write for your free copy of the Veelos Data Book and have all the facts on this adjustable v-belt at your fingertips.

VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also double V in A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. Veelos is known as VEELINK outside the United States.

MANHEIM MANUFACTURING & BELTING COMPANY, MANHEIM, PA.

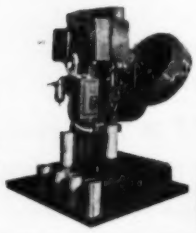
Have You An Assembly Problem?

LET OUR SPECIALISTS HELP YOU

Are you still using slow uphill hand methods that keep your assembly department in low gear and labor costs in high? Discard them and get on to the rapid straight-away of speedy, inexpensive production offered by D.P.S. power-driven machines.

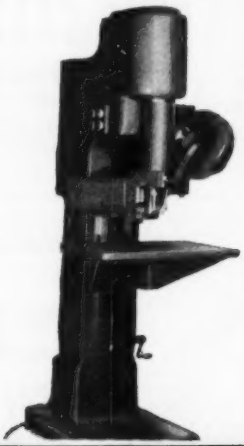
DETROIT POWER SCREWDRIVERS

Drive screws as fast as one a second—all types of screws—no marring of heads or stripping threads—all screws driven to uniform tension—Hopper-fed—SCREWS ALWAYS IN SIGHT OF OPERATOR—3 models, one to fit your requirements.



SPECIAL ASSEMBLING MACHINES

For light assembly operations using Hopper Units to feed component parts.



DETROIT POWER NUT DRIVER

A revolutionary new machine that drives nuts with amazing speed, either semi-automatically, or it can be adapted to full automatic operation entirely eliminating the manual handling of nuts. Capacity: nuts, 3/16" min. to 1 1/16" max. across flats.

THE HOPPER UNIT

Motorized—Highly Adaptable—A selective feeding device whereby production parts are selected, oriented and fed in a given position for primary and secondary operations.

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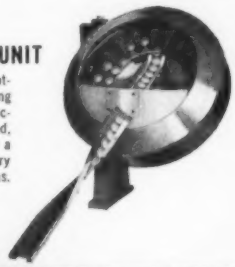

DETROIT POWER SCREWDRIVER CO. 2797 W. FORT ST. DETROIT 16, MICH.

"ROCKWELL" HARDNESS TESTER

Made Only by Wilson

● When you invest in a "ROCKWELL" Hardness Tester, we don't know whether it will be used by your Chief Metallurgist or an inexperienced girl in your inspection department. We don't care to know. Because every "ROCKWELL" Tester is made to fill all requirements and to meet all conditions of use.

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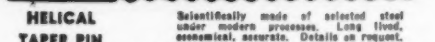

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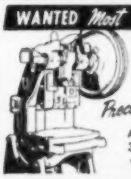

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Available in sizes from 3 to 105-ton capacity. Write for Catalog

THE V&O PRESS COMPANY DIVISION OF HARTFORD-EMPIRE COMPANY

Builders of Precision POWER PRESSES and FEEDS Since 1889 HUDSON, N.Y.

B & RB PRECISION BEARINGS

Are selected for dependability and greater capacity. Standard sizes are carried in stock.

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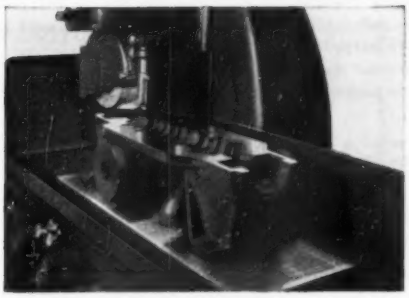
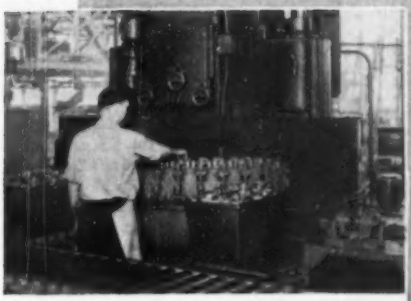
THE BALL AND ROLLER BEARING CO.

DANBURY, CONNECTICUT

WHERE THERE IS A FLAT SURFACE TO GRIND THERE'S A MATTISON TO GRIND IT.



40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder.



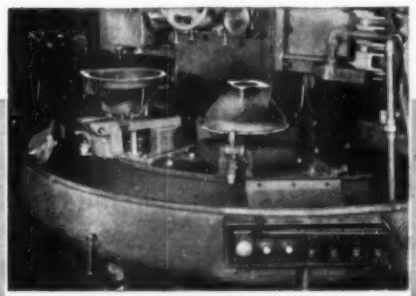
700 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison is now in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced engineers are available to give you best production efficiency, finish and tolerances, with Mattison machines.

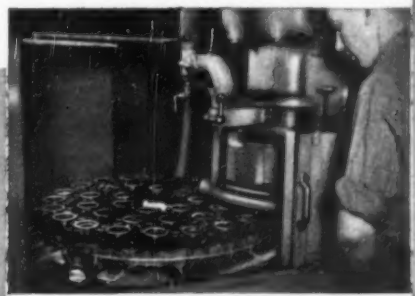
For any flat grinding ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalogs on any of the types shown or if you would like a copy of the general bulletin, let us know and we'll gladly send them to you.

Grinding Cast-Iron Cams — 5" diameter, 1⅛" thick — stock removal, each side .030". Production 120 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.



200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".



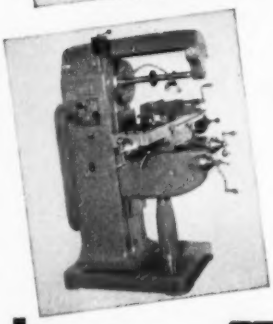
320 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

MAKE INDEX Your Choice

Get a Head Start on Production with these RUGGED, VERSATILE, EXTRA CAPACITY MILLING MACHINES



Whether it be the heaviest jobs or light production, you will find these improved, low-cost machines ideal for the purpose. They offer speed and precision to meet present-day stepped-up schedules, while assuring a substantial saving in time and labor. Get details about their many advantages now.

Model 55 IMPROVED VERTICAL MILL. A speed range of 80 to 2700 RPM's combines with a 1 H.P drive, 3¼" quill, and extra rugged spindle mounted on over-size precision ball bearings to give a capacity of ⅛" to 1½" end mills in steel. Spindle quill travel is 5¼" either by lever, hand wheel, or power, and has adjustable positive stop and automatic safety throw-out. Table 40" x 9" or larger. Longitudinal table power feed has 8 geared feed changes.

Model 60 PLAIN HORIZONTAL MILL. A full No. 1, that in many ways equals or exceeds a light No. 2 in capacity. Low maintenance due to all rapid moving parts running in oil, hardened alloy gear train, and fully ground alloy steel spindle mounted on pre-loaded precision ball bearings requiring no adjustment. Standard table 40" x 9" overall, with larger table optional, is supported by 18" of saddle bearing, and has accurately ground lead screws for transverse and longitudinal movement. Constant flow coolant system of 8 gallon capacity starts and stops with spindle.

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INDEX MACHINE CO.

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American Machinist

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The Advertising Research Foundation's first readership study of a metalworking magazine reveals that *American Machinist* readers want and seek information on the new machinery, equipment, materials, and other products that can help them do a better production job.

The New Shop Equipment, Materials, and Parts Department . . . devoted entirely to illustrations and descriptions of new products available . . . received higher readership and attention (72 per cent) than any other editorial item surveyed in the March 6, 1950 issue . . . strong evidence that *American Machinist* is a good place to do business with America's biggest industry.

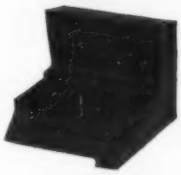
How to stretch critical tool steels

WITH DISSTON® HOT ROLLED SHAPES

EXAMPLES OF STEEL SAVINGS YOU CAN GET WITH DISSTON HOT ROLLED SHAPES:

This Disston Hot Rolled Shape

made this knife

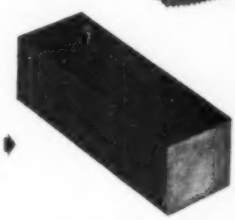


saving 51% over this!

This Disston Hot Rolled Shape

made this vise jaw

saving 55.26% over this!



Save up to 50%—and more—on the tool steels you now use. And save not only steel, but machining and manpower also!

Disston Shapes can be rolled in a variety of forms to fit your exact specifications. Tolerances are extremely close, and very fine finishes can be furnished. Disston Hot Rolled Steel Shapes can be made in both alloy and carbon steels, in electric and open hearth grades.

Disston engineers and metallurgists will be glad to work with you in developing the special shapes that will give you the greatest economies. Write us, specifying your needs.

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1220 TACONY, PHILADELPHIA 35, PA., U.S.A.

A few of the many forms of DISSTON HOT ROLLED STEEL SHAPES

IT MAKES A DIFFERENCE WHETHER

THE MAN OR THE MACHINE IS BUSY

H&G

A BUSY man at an IDLE automatic spells LOSS

an IDLE man at a BUSY automatic spells PROFIT

H & G INSERT CHASER DIE HEADS

are mechanically right, functioning flawlessly at high speeds for hours on end. They minimize down time, gaining as much as an hour a day in net production.

There's nothing like a demonstration to convince the man who must be shown.

FREE Literature currently available

- ☐ Bulletin 32 "Selecting Proper Die Head for the Job"
- ☐ Decimal Equivalent Wall Chart
- ☐ Cost Reducing Suggestions on the Design for Threaded Parts

Name

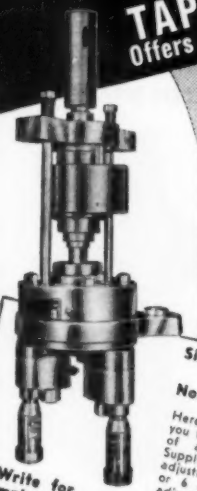
Address

THE EASTERN MACHINE SCREW CORP.

Manufacturers of H & G General Purpose Die Heads, Insert Chaser Die Heads, Threading Machines

20-40 BARCLAY STREET **New Haven 6, CONNECTICUT**

Only **ERRINGTON** *Adjustable* **TAPPING HEAD** Offers So Many Advantages



- Fully geared
- Needle bearings on all spindles in head
- Ball thrust bearings throughout
- Bronze bushed
- Sand cast aluminum case
- All parts fully enclosed for pressure lubrication and protection
- Non-slip positive clamping on all adjusting members

Sizes: #0—#10 Tap to 5/16"
#1—3/16" Tap to ½"

No. Spindles: 2 to 6

Here's a versatile tool which permits you to take advantage of a wide range of adjustment — without overhang. Supplied with 3 spindles for equal adjustment in line and 3, 4, 5, or 6 spindles for equal adjustment on bolt circles.

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Established 1891

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JIG BORING

PUT SMALL JOBS ON THIS

LINLEY MACHINE

and save your larger machines for heavier work.

YOU'LL BE SURPRISED!

at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7" x 17½" table size.

Write TODAY For Full Information

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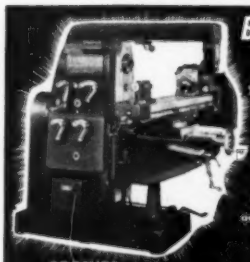

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Simple in design. Easy to operate. Rigid construction including every worthwhile modern feature of milling machine development. With 18 spindle speeds (20 to 1000 R.P.M.) both the universal and plain millers are readily adaptable for heavy duty or light precision production work. Send for bulletin.

GREAVES No. 2-M MILLING MACHINE PLAIN OR UNIVERSAL

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Greaves MACHINE TOOL COMPANY

Division of J. & T. & E. CAN CO.

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Machine tools are the blue chips in our bid for continued leadership in industrial production.

But take ball and roller bearings away from machine tool makers, and today's production techniques, speeds and tolerances would be impossible.

Working with machine tool designers and builders, SKF has helped them not only to meet today's demands but anticipate tomorrow's needs.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PENNSYLVANIA—*the Pioneers of the Deep Groove Ball Bearing, Spherical Roller Bearing, Self-Aligning Ball Bearing.* 7038

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Integrity · Craftsmanship · Metallurgy · Tolerance Control · Surface Finish · Product Uniformity · Engineering Service · Field Service

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use "AMERICAN SWISS"

SWISS-PATTERN FILES

Those final finishing touches can make or break a job—they need the finest of files as well as a skilled craftsman. With "American Swiss" Swiss-Pattern Files, you can always be sure of clean sharp teeth that remove just the right amount of metal from just the right places. You can be sure, too, of the uniformity of hardness throughout the length of every file that helps you judge the filing pressure to be used. You're always safe with "American Swiss."

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ASK FOR THEM BY NAME

American Swiss ★✚★

SWISS PATTERN FILES

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What are the various kinds of hand tools? What do they look like? How, when, and where do you use them? How do you take care of them?

You can find the answers to these and other often-asked questions in the *American Machinist* Special Editorial Report, "Know Your Hand Tools." This 12-page article, containing illustrative drawings, costs only 20 cents per copy. Write Reader Service Department:

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Give *Start-to-finish* work holding

Off the swivel base, end down for accurate marking.

Back on the swivel base, at the bench, for center punching.

Lifted onto drill press, still accurately in position.

Held in same position but moved to milling machine.

Take a job through every step without a misstep . . . faster, easier . . . in a "Yankee" Vise. Work lined up accurately from bench to drill press, to milling machine and back to bench. Lifts off and on a swivel base at the bench. Vise squared on top, bottom, sides and front end for machine work. Easily made into handy, economical jig. Hardened steel block, V-grooved, provided with each "Yankee" Vise. Four sizes, with and without swivel base . . . 1½", 2", 2¾" and 4" jaw widths. Your industrial distributor carries the full line. **"Yankee" Tool Book FREE!**

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

"YANKEE" TOOLS NOW PART OF
STANLEY
THE TOOL BOX OF THE WORLD

50 YEAR report to our customers -

FROM DATE OF INCORPORATION ON NOVEMBER 23, 1900 TO DECEMBER 31, 1949

THE COMPANY RECEIVED:			
From customers for products purchased by them		$5,122,702,261	
Dividends received, interest earned, and other income		76,068,236	
Total revenues		$5,198,770,497	
THE COMPANY PAID OUT OR PROVIDED:			
For raw materials, supplies, and services bought	$2,766,354,971		
Provision for depreciation (wear and tear or obsolescence) of plants, buildings, machinery and equipment and for depletion of coal, iron ore and limestone, etc., by mining operations	270,852,769		
Federal, State, local and miscellaneous taxes	267,462,953		
Interest and other costs on long-term debt (including dividends of $27,265,805 paid to preferred shareholders)	117,724,128		
Total costs		3,422,394,821	
Leaving for wages and salaries of employees, dividends to shareholders, and amount required to be retained by company for needs of the business		*$1,776,375,676	100.00%
***OUT OF WHICH THERE WAS PAID:**			
Employment costs (pay rolls, vacations, social security taxes, insurance and pensions paid to or for account of employees)		$1,474,693,687	83.02%
To common shareholders as dividends		125,126,950	7.04
Amount retained in the business for present and future needs and to assure steady work for employees		176,555,039	9.94
Total		$1,776,375,676	100.00%

Your patronage and the American system of free enterprise have helped make this company an important factor in the steel industry. Our future depends on keeping America free, so that any group of citizens may organize a business, at any time--with the expectation that it, too, may grow strong--provide jobs, supply needed products and achieve success in the next 50 years. In the preservation of the American way of life lies our future hope.

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ROTARY SHEARS
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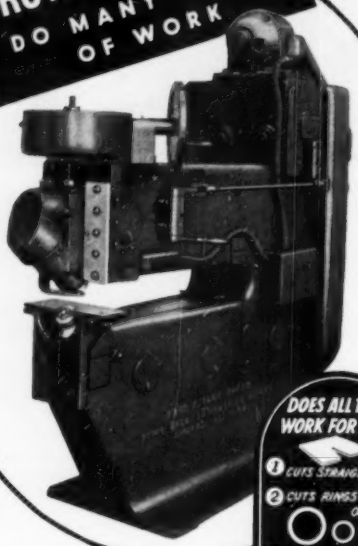

DOES ALL THIS WORK FOR YOU

1. CUTS STRAIGHT LINES
2. CUTS RINGS—SMALL OR LARGE RADII
3. CUTS CIRCLES
4. MAKES FLANGES
5. CUTS INSIDE HOLES WITHOUT CUTTING IN FROM EDGES
6. JOGGLES & OFFSETS
7. CUTS ODD SHAPES
8. BEVELS AT ANY ANGLE
9. CUTS REVERSE CURVES
10. BEADS & U'S

ALL WITH Hairline PRECISION

Yes, and With Hairline Precision

Rapid operation . . . Hairline Accuracy . . . the use of Kling Rotary Shears marks the latest development in cutting mild steel, and sheet metal, up to 1-inch with amazing savings in time, labor and production costs.

For exacting projects (see illustration at the right), no single unit of metal-working equipment does so many different things so cleanly and efficiently as does the Kling Rotary, pictured above.

In metal-working plants, automotive, aviation, home appliance, and other industries, where work of this character is being done—this machine is held in high regard for its versatility and economy of operation.

This great usefulness is the result of half-a-hundred years of engineering experience which prospective buyers, with reason and respect, applaud.

Send Today for Bulletin No. 245

which will give you specific facts, and specifications. No obligation involved. Users of heavy equipment of Kling Rotary Shears' class will receive a copy of this Bulletin promptly, on request.

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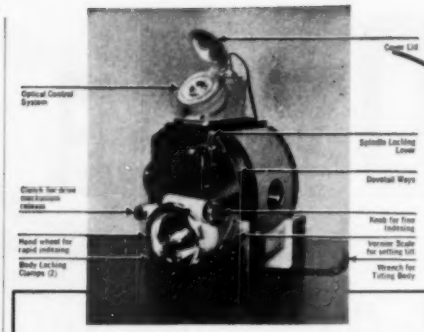

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Over 42 per cent of metalworking production equipment was over 10 years of age in 1949 . . . 19 per cent was bought more than 20 years ago. These machines have had an average of a quarter century of use, including five years of wartime overwork and mistreatment.

How does *your* production machinery and equipment compare with your competitors', and with the Metalworking Industry's in general? The answers will be found in the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment.

Here are all the facts on the age and number of 155 major types of production equipment operating in 15 metalworking divisions and 25 major production areas. Cost is $2.00 per copy.

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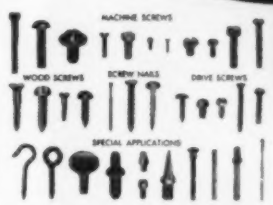

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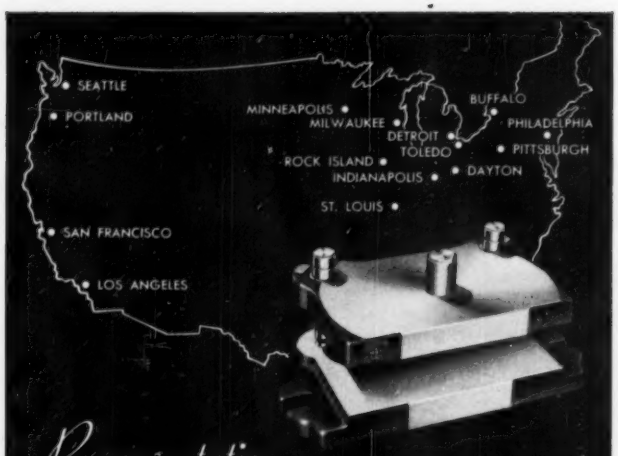

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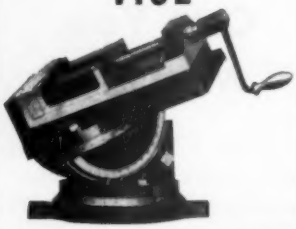

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Fully universal, 3 swivels simplify the setting of compound angles. Parts are interchangeable. Can be used as a plain flanged vise, swivel vise, and multi-swivel vise.

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Platen, interchangeable with vise. Increases capacity of unit. Uses: as plain platen, multi-swivel platen.

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From the *American Machinist* Library of *Tips for Top Shop Men*

YOU have no real right to the title "Boss" until you've trained subordinates to shoulder most of your responsibilities—and learned further to give them credit for what they do.

THE more arguments you win, the fewer friends you have. You can be *the* right guy or *a* right guy, just as you choose.

MEN are like steel—when they lose their tempers they're useless. Remember to keep your own usefulness.

Don't Miss

The 1951 Production Preview

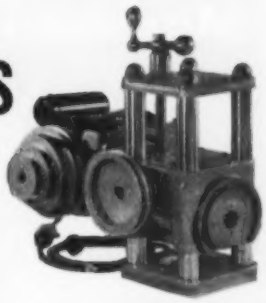
January 22, 1951

Illustrations and descriptions of 1700 items of new equipment . . . statistical report of 1950 . . . and a forecast of Metalworking in 1951.

How to reduce costs in milling, drilling, grinding

by using VERSA-MIL to do

MORE JOBS ON ONE MACHINE

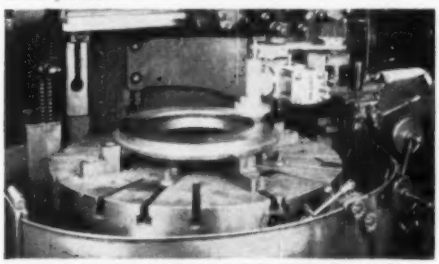


Size 2 Basic Unit

6" travel on posts; #3 Morse taper; 6" x 6½" base; Weight: 89 lb. with ½ hp. AC motor; 104 lb. with ¾ hp. AC motor.

1. CUTTING KEYWAYS 48" APART: Lathe plus Versa-Mil permits easier, more economical milling of difficult pieces. Here, a series of widely separated cuts, accurately aligned and to precise depth are obtained without resetting work piece.

2. LARGE CASTINGS DRILLED FOR 1/2" HOLES: Here Versa-Mil saves handling and crane time by finishing a heavy casting in one set-up on planer. Across-the-bed cuts can also be made while work piece is still in position.



3. SURFACE GRINDING ON VERTICAL TURRET LATHE: By combining Versa-Mil with large single-cutter tools such as planers and vertical boring mills, large pieces beyond the capacity of most shops may be ground.

Here's a cost-cutting tool that permits you to do a wide variety of jobs on almost any machine tool you have—engine, toolroom or turret lathe, vertical or horizontal boring mill, or planer. With these *and Versa-Mil*, you can mill slots, faces, gears . . . you can drill, bore, ream . . . you can grind cylindrical and flat surfaces. All on the *single* machine. All with *precision*. All with money-saving *speed*.

By doing several, and often *all* of the required operations with a single set-up, you cut preparation and handling time. You free other machines for other production.

TAKE THIS TOOL TO TOUGH MAINTENANCE JOBS

You can adapt Versa-Mil to take into the plant or field to do repair-machining on the spot. You save dismantling and transportation. Downtime is reduced to a minimum. Obviously, the heavier, the more cumbersome the equipment that requires the machining, the more you save with Versa-Mil.

Like the many well known companies now using one or more, you, too, will find Versa-Mil opens up new opportunities for reducing costs in precision machining. Write for new bulletin just off the press.

VERSA-MIL COMPANY
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COMPANIES LIKE THESE ENDORSE VERSA-MIL!

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General Electric Co.
International Harvester Co.
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Westinghouse Electric Corp.

Many of these companies and also others have re-ordered additional units again and again!

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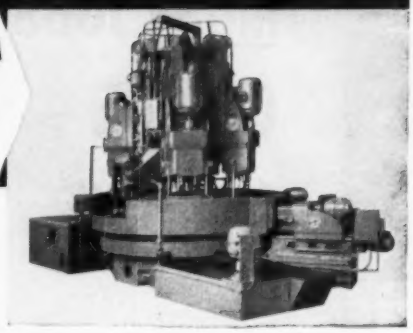

Here's a good example of the application of standard machine units to a special production job. Drilling and reaming operations of suspension support holes are performed on both right-hand and left-hand parts simultaneously. Drilling and reaming king pin holes is also included. Six stations, five operating and one loading, handle all operations with a total of 16 spindles. Machines of this type can be furnished from standard basic units for special applications on most all metalworking operations.

For Combined Operations or Single Purpose Machines

Machines similar to this can be designed to handle dissimilar operations in the same parts or one operation on continuous production. An indexing table with ROTO-MATIC POWER HEADS is easily arranged to suit special machining operations.

Lower Maintenance Costs with ROTO-MATIC Mechanical Power Heads

This machine is a good representative of the applications of D. & T. Roto-matic mechanical power heads. Six heads are used, three vertical and three horizontal. These new power heads lower maintenance costs through elimination of excessive servicing.

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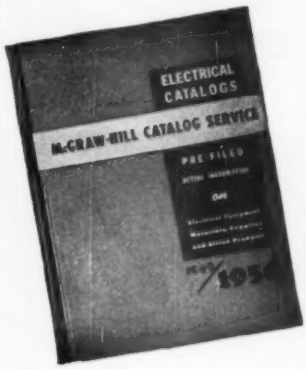

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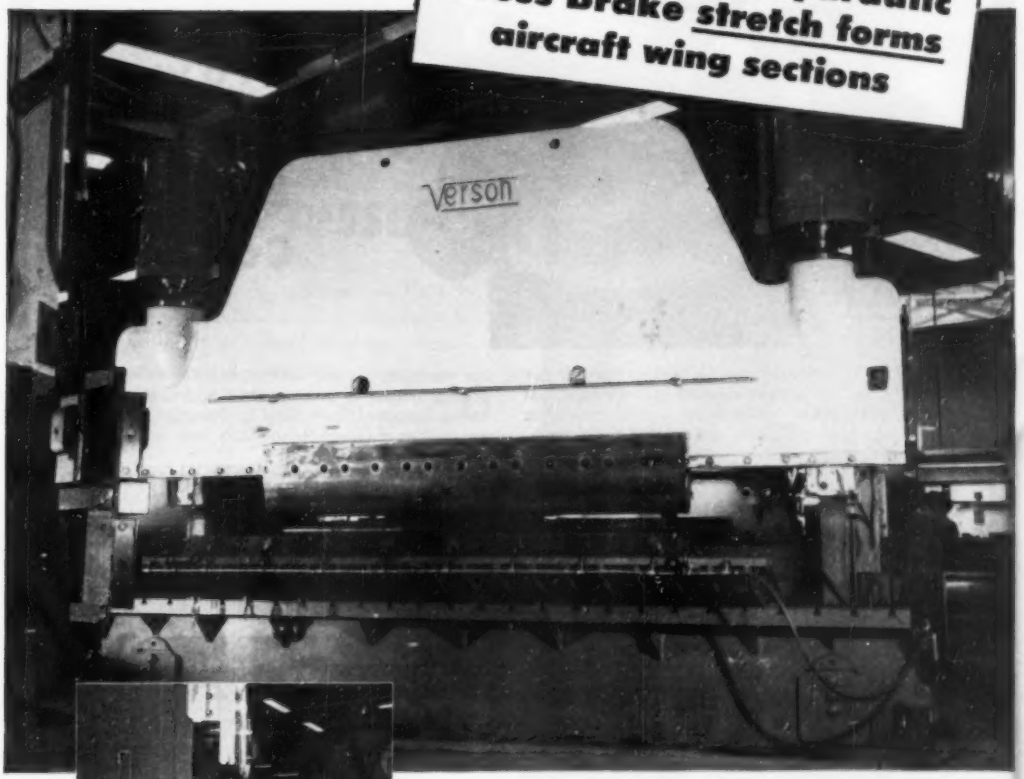
From The *American Machinist* Library of *Tips for Top Shop Men*

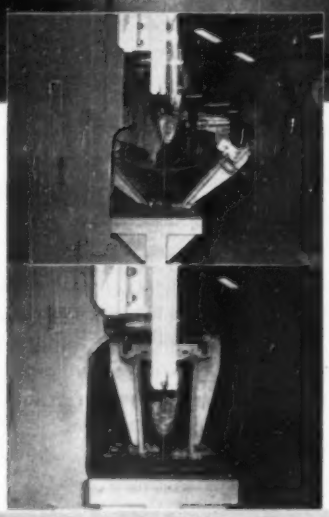
YOU can step up interest in company headaches by skits in which employees do the acting. Shop problems can be dramatized with topics selected by the players. Not only does the message go over better but the actors are happier on their jobs.

BEWARE of being too frank. If you always call a spade a spade, it's difficult to avoid giving somebody a dirty dig.

DON'T have too much respect for the man who takes his time, because he's taking your time too.

This —Verson— Hydraulic Press Brake stretch forms aircraft wing sections





TYPICAL of the many jobs that can be done better and more economically in a Verson Hydraulic Press Brake is the small radius stretch forming of leading edge sections of wings for jet aircraft. With the tool-up illustrated, a leading aircraft manufacturer is doing this job speedily on a production basis with an initial investment that was a small fraction of that required for a conventional stretch press . . . and the utility of the brake for customary applications is in no way impaired.

For the many jobs where the advantages of hydraulic power are necessary or desirable for press brake operations, it will pay you to consider Verson Hydraulic Press Brakes. Verson engineers will be pleased to give you the benefit of their extensive experience.

The illustrations above and at the left show the stretch forming tool-up. Sheets are held in pivoted clamping fixtures and the die descends to form the section. Radii as small as 1/8" have formed on a production basis.

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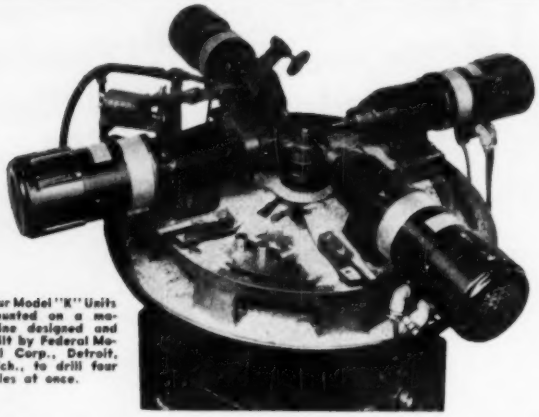

Four Model "K" Units mounted on a machine designed and built by Federal Mogul Corp., Detroit, Mich., to drill four holes at once.

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Users of Govro-Nelson Automatic Drilling Units are our authority for the somewhat startling statement that multiple drilling with our units has usually resulted in stepping up the production rate from 4 to 10 times, with a corresponding decrease in labor costs.

For example, on one Govro-Nelson installation, the present output of one operator is greater than the former output of three. Send for literature showing the possibilities of Govro-Nelson Units from the standpoint of reducing labor costs.

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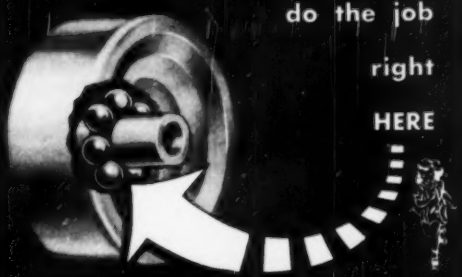

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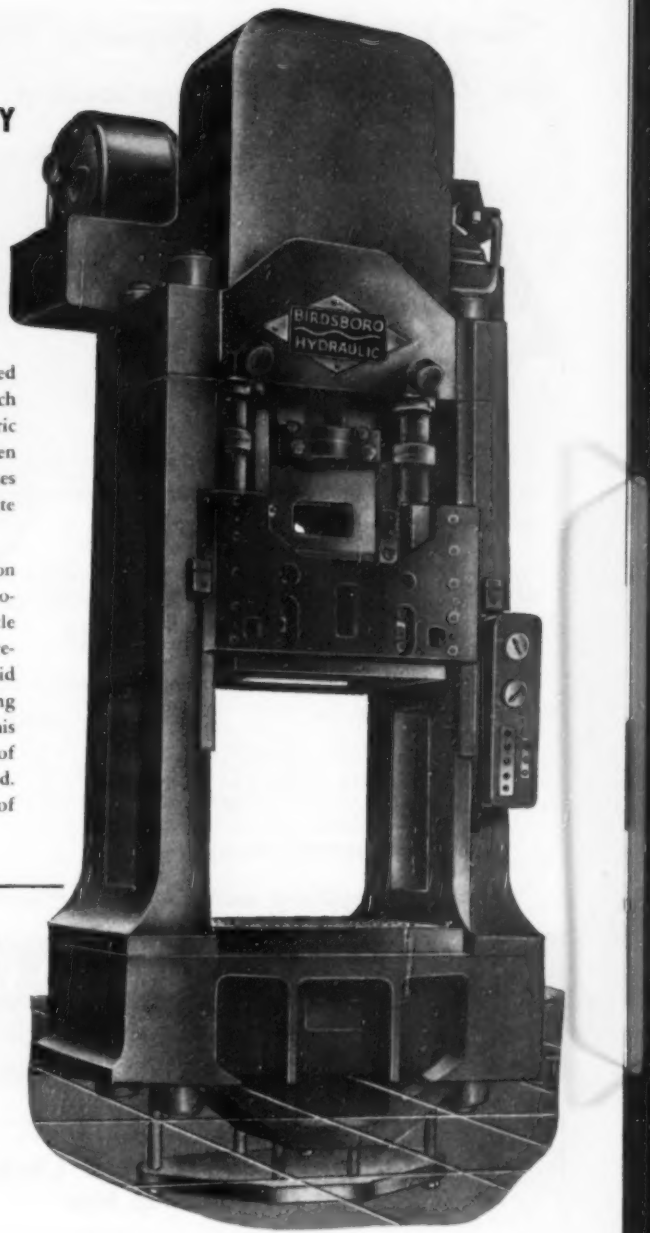

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...yet he hasn't had a Chest X-Ray!

He checks every piece of mechanical equipment he owns for wear, lubrication, efficiency.

Yet he fails to take the simple precaution of a Chest X-Ray to make sure he does not have tuberculosis. *Not because he's opposed to the X-Ray. Simply because he is not sufficiently informed—or just hasn't taken the time and trouble, or does not realize the seriousness of the problem.*

A Chest X-Ray is the first step toward detecting tuberculosis in its early stages. And in its early stages it can be cured with the least loss of time from work.

So, if you're the man above, that one simple reason should make you get your Chest X-Ray—*today*. But listen, see how serious this really is:

Between the ages of 15 and 34, tuberculosis leads all other diseases as a cause of death—although at no age are you safe from TB. Yet, if everyone does his part by getting a Chest X-Ray periodically, and the majority of cases thus discovered are followed up, we can eliminate TB entirely as a public health hazard!

Will you do your part today? Get a Chest X-Ray. It may mean your life!

Published in the public interest by:

McGRAW-HILL PUBLICATIONS

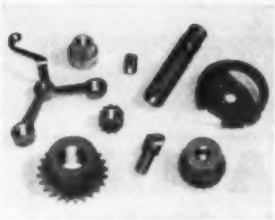
PRODUCTION

On One Hole Size . . .

Or Dozens of Different Sizes

SUNNEN HONING

- Saves Hours of Set-up and Production Time
- Produces Exact Size and Finish



Typical parts honed at Gellman Mfg. Co., Rock, Island, Ill.

SUNNEN HONING is versatile

It's used for everything from de-burring to micro-fitting. One easy-to-use machine handles both long runs and short, with quick changeover from one hole size to another. Hones metals of all hardnesses except lead . . . hones carbides, ceramics, glass, plastics . . . all sizes from ⅛" to 5½" . . . open and blind holes . . . holes with keyways, ports and lands. Set-up time is about a minute between jobs. Many owners save the cost of the machine *on salvage jobs alone* — reclaiming expensive rejects from other operations.

Clutch Pawl honed at Jacquard Knitting Machine Co., Philadelphia

Material: 1020 steel
Stock Removal: .002"
Tolerance: ± .0005"
Production: 100 per hour (includes gaging)
Hardness: Rockwell "C" 62
Finish: 10 micro-inches

SUNNEN HONING IS FASTER TODAY than ever before

In the country's leading plants you'll find job after job where holes are sized and finished at rates of 60 to 400 per hour. Stock removal ranges from de-burring to as much as .010 in some cases. Accuracy of .0005 is typical—can be held to 25 millionths. Sunnen Honing produces geometrically true holes, free from bell-mouth, taper and warpage, with surface finish to 2 micro-inches R.M.S. in hardened steel.

PROMPT DELIVERY

from stock of machines, tools, supplies. Trained honing engineers are at your service, without obligation. Send the coupon for details.

SUNNEN PRODUCTS COMPANY
7928 Manchester Ave., St. Louis 17, Mo.
Canadian Factory: Chatham, Ontario

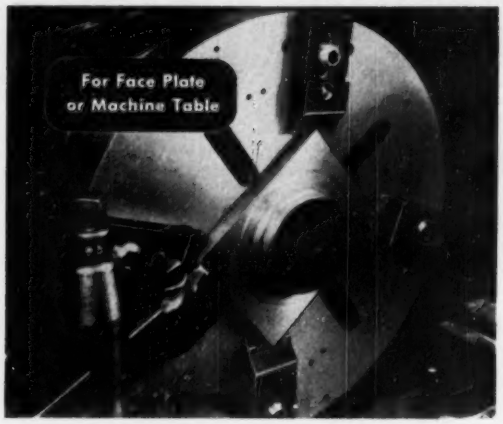
SUNNEN PRODUCTS COMPANY
7928 Manchester Ave., St. Louis 17, Mo.

☐ Send Free Bulletin MB-12 (Production Honing)
☐ Send Free Bulletin MB-10 (Tool Room Honing)
☐ Have your representative call.

Name .....
Company .....
Address .....
City ..... State .....

560

SPEED PRODUCTION RATES with NEW J&S JAW CLAMPS

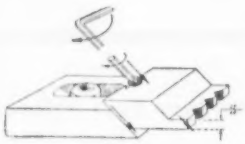


Typical lathe application shows how one-piece J & S "All-Purpose" Jaw Clamps hug machine surfaces, reduce obstruction. Work-piece is removed by simply loosening one screw in each of two adjoining clamps. No re-positioning necessary for next piece.

J & S "*All-Purpose*" JAW CLAMPS

Eliminate U-Clamps and Straps—Workpieces Positioned, Held, Removed with ONE Screw!

Faster set-up, stronger grip, less obstruction of work-piece—all are yours with unique new J & S "All-Purpose" Jaw Clamps. An ingenious "double-action" grip provides their amazing strength, simplicity, and speed of operation:



The angle of jaw travel is 45° to plane of the face plate or table. When the screw is tightened, the jaw forces the work-piece **down** against the machine surface — **across** against the opposite clamp. This locks the work-piece in a grip that is stronger than that provided by **eight** U-clamps!

As the drawing shows, the jaws of the J & S Clamp are only 23/64" thick. Thus, you can get overall machining to within ⅜" of the machine's working surface! Point for point, the new clamp provides tremendous advantages over all older kinds. They are available in types and sizes to suit all applications—"T" nuts are furnished to fit all standard machines.

WRITE FOR NEW FOLDER!

—Contains complete details on advantages, applications, types and sizes available.

●

J & S "All-Purpose" Jaw Clamps are one of the popular J & S "Machine Shop TIME SAVERS." ("Time Saver" booklets, describing J & S "Fluidmotion" Wheel Dressers, etc., available on request.)

J&S TOOL CO., INC.
479 Main Street, East Orange, N. J.
Representatives in Principal Cities

SURE CURE FOR PUMP HEADACHES

Forget pump worries. Tuthill small pumps are recognized the world over for their dependability in lubrication, coolant, hydraulic and liquid transfer service. These internal-gear type rotary pumps are available in capacities up to 200 g.p.m. and pressures up to 400 p.s.i. Wide choice of porting and mounting arrangements in both packed and mechanically sealed pumps. Write for General Catalog.

TUTHILL PUMP COMPANY
939 East 95th Street, Chicago 19, Illinois

KEYSEATING
The Modern Way

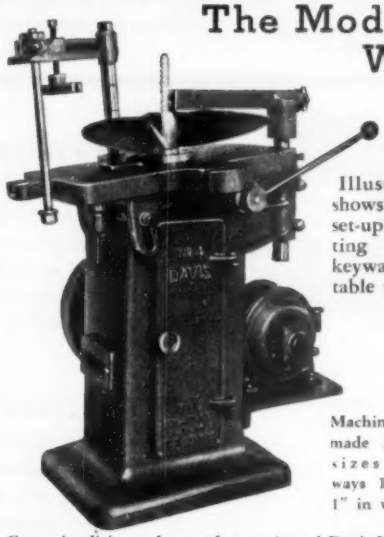


Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

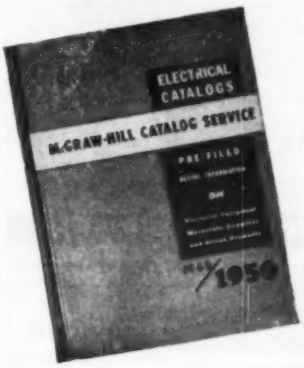
Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

When the need for an electrical product arises in your plant, get the habit of referring to the

McGRAW-HILL Pre-Filed ELECTRICAL CATALOGS



Several hundred pages of manufacturers' buying information will help you compare and select. The directory lists all known manufacturers, classified alphabetically and by product.

If the Pre-Filed ELECTRICAL CATALOGS are not available for buying reference at your plant, write to:

McGRAW-HILL CATALOG SERVICE
330 W. 42nd St., New York 18, N.Y.

There is no charge to qualified users.

NEW tapping head SLASHES COSTS on large hole tap jobs!

★ **Production increased as much as 100%**

★ **Drastic reduction in spoilage**

★ **Greatly increased tap life**

This completely new Procunier "TAP KING" high speed tap head is revolutionizing methods . . . drastically *cutting production costs* on difficult large hole tapping jobs. Spectacular daily *production gains* with this new unit have *run as high as 50-100%!* In addition, users reported amazing savings in parts spoilage and consistent, accurate maintenance of uniform tap depth . . . even on large *blind hole* tapping jobs!

Construction features include: capacity ⅜" to 1" in steel and 1¼" in softer materials; powerful friction clutch; exclusive spline drive to tap holder spindle; ball and needle bearings; rigid, lightweight "TRU-GRIP" tap holder; helical back gear reversing mechanism; lightweight aluminum housing and many other unusual advantages.

Here is the answer to your toughest large hole tap problems . . . write for full details today!

Procunier High Speed Tapping Heads are available in 4 sizes with capacities from #0 to 1⅛"

NEW!
LARGER! Procunier "TRU-GRIP" Tap Saver

Small size makes tapping easier close to walls or shoulders, eliminates "chewed" tap shanks. Lighter, smaller in diameter it drives the tap by the square, holds it true by the round.

PROCUNIER SAFETY CHUCK CO., Dept. 12
14-18 S. Clinton St., Chicago 6, Ill.

Gentlemen:
Please send me full details on the new Procunier "TAP KING."

Name _____
Address _____
City _____ Zone _____ State _____

Procunier
Safety Chuck Company
14-18 S. Clinton St., Chicago 6, Illinois

From The *American Machinist* Library of *Tips for Top Shop Men*

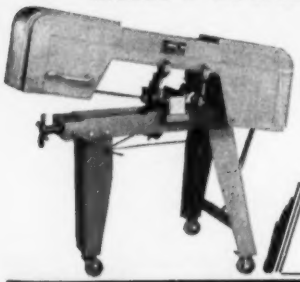
THE method or process you're surest is the ultimate is the one most susceptible to improvement. Nothing is so dangerous as the method you're certain is the last word.

BE lazy, in a constructive way. Save your time and energy by doing things when they should be done—or even before. The soundly lazy man gets things done on schedule and avoids the hard work of catching up.

"JUNIOR" does a MAN-SIZE JOB

Yes, this Johnson "Junior" Band Saw can do a real job. It's small and handy, yet sturdy, and has speed, versatility and accuracy. Use it for production or occasional cutting in small shops or large plants. Furnished with or without casters. Roll it or carry it. Move it in a jiffy to do countless jobs.

JOHNSON "JUNIOR" MODEL B BAND SAW



5" x 10" capacity. Inexpensive. Will pay for itself many times over.

ALSO MODEL J, a heavy, sturdy tool. Capacity 10" x 18".

Write for CATALOG!

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

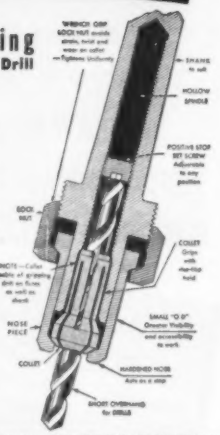
"More Holes Per Grind" with the ERICKSON Precision Collet Chuck

BECAUSE IT
Permits Drill Stubbing

- Reduces Down Time and Drill Breakage.
- Holds Hole Sizes.

To get maximum efficiency and full life from a drill, it is essential that cutting edges cut equally. Edges can only cut equally when the drill is held rigid and concentric. When you can guarantee this condition you get "more holes per grind."

The Erickson Precision Collet Chuck **does** guarantee this condition. Chuck accuracy of .0005 TIR is guaranteed, insuring maximum concentricity in the drill. Stubbing gives a short, rigid column, reducing stress. Users report up to 85% less drill breakage with the Erickson Collet Chuck.



WRITE TODAY FOR FULL DETAILS!—*ASK FOR CATALOG C-2*
Remember, there's an Erickson answer for every holding problem.

ERICKSON TOOLS DIVISION
2302-H HAMILTON AVE. CLEVELAND 14, OHIO

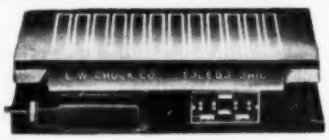
Our Business Has Been Built on Selling Fine Chucks for Less Money

L-W MAGNETIC CHUCKS

Supplied with connections for either 110 or 220 volts D.C.
Grip Work Tightly for Wet or Dry Grinding

GUARANTEED WATERPROOF

5¾"x13" $55.37
6½"x18" $73.40
8"x24" $127.03
10¼"x37" $234.81



DEMAGNETIZERS

A single pass over the stationary poles completely demagnetizes work. 110 volt A.C. Model B-2 for large work, 7½" x 12½" x 6¾". Ship. wt. 55 lbs. $73.45
Model J-1 for small work, 7¼" x 7¼" x 6¾". Ship. wt. 35 lbs. $47.83

RECTIFIERS

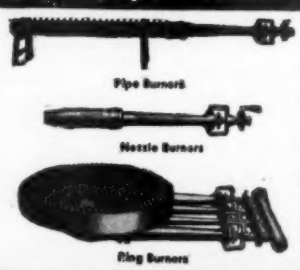
A.C. Input 110 volts. D.C. output 110 volts. P-1 for 5¾" x 13" chuck 0.8 amps. $45.04
P-2 for 6½" x 18" chuck 1.8 amps. $52.30
P-3 for 8" x 24", 10¼" x 37" chuck 3.0 amps. $69.73

DEMAGNETIZING SWITCHES

For 5¾" x 13" and 6½" x 18" sizes $10.35
Field discharge type for 8" x 24" and 10¼" x 37" $18.90

L-W CHUCK COMPANY 25 SO. ST. CLAIR ST. TOLEDO 4, OHIO

BUZZER Gas BURNERS



NO BLOWER OR OTHER POWER NEEDED!

. . . JUST CONNECT TO GAS SUPPLY.

Designed to solve innumerable Heat applications. Unexcelled for efficiency, economy, simplicity, and flexibility.

The Complete "BUZZER" catalog shows Gas Burners, Furnaces, and other equipment. Write for your copy today.

CHARLES A. HONES, INC
121 So. Grand Ave. Baldwin, L. I., N. Y.

RANDALL and STICKNEY
Dial Gauges and Indicators

Model C

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005-in. or .01 mm. Has a ½-in. range movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gauges Since 1885

Two answers to *one* big problem

Intelligent estimates indicate that materials handling still represents 35 per cent of the average metalworking plant's production costs. Here are two recent special reports from *American Machinist* which offer valuable answers to how these costs can be reduced . . . and quickly:

Slash Handling Costs by "Tooling" Your Shop Trucks . . . This eight-page report by Editor Miles Rowan reports on a variety of attachments available for increasing the efficiency and versatility of your shop industrial trucks, describes their use and how they will quickly pay for themselves out of savings. 15 cents a copy.

How Materials Handling Affects Plant Layout . . . Reprints of this widely acclaimed report are still available at 25 cents per copy. It's 16 pages are filled with the latest information on how production shops can best be planned for the most efficient use of modern materials handling equipment. Particular emphasis is given to the design of new buildings which can take maxmium advantage of efficient handling right from the start.

For your copies of these reports, write Reader Service Department at address below. And don't forget to read the materials handling advertising which appears regularly in *American Machinist's* pages. It keeps you up-to-date on the best and newest materials handling equipment now available from America's leading manufacturers of it.

American Machinist
McGRAW-HILL BUILDING
NEW YORK 18

DO YOU MANUFACTURE PUZZLES?

How many man hours are lost every day in your plant because metal components are not properly marked?

How much time do your customers spend trying to identify parts for reordering?

Are you losing good business because your components are not permanently and legibly marked for *instant identification?*

Would the use of modern marking equipment save you money?

Simply send prints or samples of parts to be marked, together with exact lettering and its location, for free recommendations.

WRITE FOR CATALOG

MARKING MACHINES — ENGRAVED STAMPING AND EMBOSSING DIES — SPECIAL MARKING TOOLS — NUMBERING HEADS — HAND STAMPS

IDENTIFICATION *is your* **PRIME EXPEDITER**

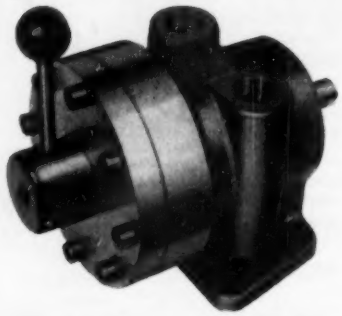
GTS
GEO. T. SCHMIDT, INC.
1810 W. BELLE PLAINE AVENUE
CHICAGO • 13 • ILLINOIS

From the *American Machinist* Library of *Tips for Top Shop Men*

BE careful neither to underestimate nor to overestimate the men you pick for promotion. A man may make an excellent production executive dealing with details and concrete things, but be out of his depth when he faces the intangibles of *administration*. He may be a whiz at watching the trees and no good at watching the forest.

AN essential to efficiency is regularity. The brilliant, but erratic—or the fast, but frequently absent—man will rarely show any efficiency. Remember the hare and the tortoise.

The *Controlled Flow*



HYDROPUMP

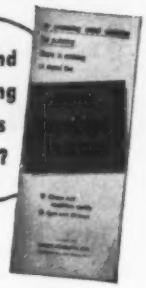
PROVIDES COMPLETE CONTROL OF
VOLUME — DIRECTION — PRESSURE
AT THE PUMP without valves

These are only some of the features that the HYDROPUMP offers. For complete information, write for Bulletin 100-P.

MILWAUKEE HYDROPOWER, INC.
3445 N. 35th St. Milwaukee 16, Wis.

This FREE Folder Tells How To Do It

Can you clean steel and condition it for painting for less than 20 cents per 1,000 square feet?



WITH minimum equipment . . . in minimum time . . . at minimum cost . . . the OAKITE CrysCoat PROCESS* cleans metal surfaces and prepares them for painting . . . prevents corrosion before and after the metal is painted. *Reg. U. S. Pat. Off.

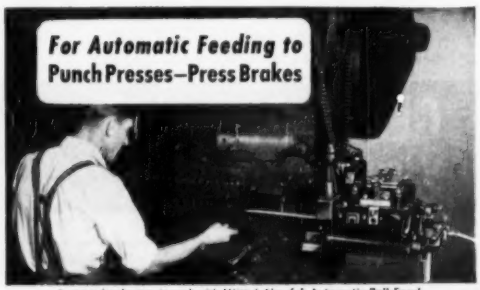
FREE Write to Oakite Products, Inc., 24 Thames St., New York 6, N. Y., for Folder F7642. This 8-page illustrated leaflet describes 19 advantages of the OAKITE CrysCoat PROCESS and lists 10 ways in which it cuts the cost of cleaning and preparing for painting.

ALSO *ask about Oakite procedures for:*

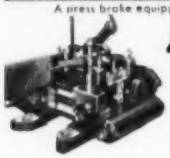
Machine cleaning	Tank cleaning	Electrocleaning
Steam-gun cleaning	Pickling	Paint stripping
Barrel cleaning	Burnishing	Rust prevention

Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE SPECIALIZED INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE



A press brake equipped with Wittek No. 6-L Automatic Roll Feed



You Can't Beat WITTEK

Wittek Roll Feeds are made in standard models to meet every requirement in the automatic feeding of strip stock to punch presses or press brakes. The distinguishing feature is their simple and economical method of operation which does away with complicated parts thereby assuring *speed* and *accuracy* in the feeding of various kinds and thicknesses of material.

Wittek Adjustable Reel Stands are designed as companion units to Wittek Automatic Roll Feeds and are available in seven different models to handle *ALL* types of coiled strip stock and wire being fed to punch presses or similar production machinery.

Write for complete descriptive literature.

WITTEK Manufacturing Co.
4320 West 24th Place
Chicago 23, Ill.

Automatic ROLL FEEDS AND REEL STANDS

1, 2½ and 5 lb. sizes—order your alloy lead hammer requirements from your machine tool supply house

or direct from:

KITZMAN MFG. CO.
15410 STOEPEL AVE. DETROIT 21, MICH.

ATTENTION REAMER BUYERS
70 YEARS CHOICE OF TOOL EXPERTS

REAMERS, MILLING CUTTERS, END MILLS, SPECIALS
ALVORD-POLK TOOL CO. Millersburg, Pa.

D.A. Stuart Oil co.
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Cutting Fluids and Lubricants

Here's Why it Pays You to Read the Advertising

The advertising is a rich source of valuable information. In this magazine it offers you ideas and products that may well apply advantageously to your business.

Every issue is a catalog of goods, materials, and services — quickly available to you — just for the reading.

Leaders in business and industry turn to the advertising because they've discovered it helps them run their businesses more profitably.

When you read all the ads in this magazine, the chances are good that you'll get a lead that will materially help you do a better job. For example, you may find a specific piece of equipment that will be a profitable time-saver. Or a tool that will increase worker efficiency. That's why it pays to read the advertising. It's good business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

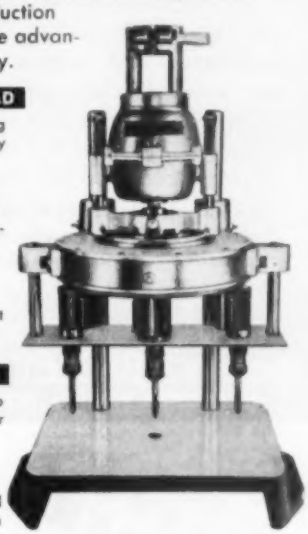
F-25

5 Basic Advantages

. . . plus proven design features and quality construction add up to big savings in . . .

Ettco-Emrick ADJUSTABLE SPINDLE MULTIPLE HEADS

Wherever they are used, Ettco-Emrick Adjustable Multiple Heads quickly pay for themselves many times over in terms of increased production and lower unit costs. Check these advantages and you'll understand why.



1 DRILL OR TAP WITH SAME HEAD

Quickly and easily converted from tapping to drilling—and back again—merely by changing face plate and chucks.

2 ACCURACY TO CLOSE LIMITS

Jig-bored tamplate accurately locates spindles and prevents them from creeping.

3 FULL VERSATILITY

Spindles can be readily positioned to meet a wide range of hole combinations.

4 ENGINEERED FOR HIGHEST PRODUCTION

Head, workholders and fixtures are built to give highest possible production on your particular job.

5 LOW TOOLING COSTS

Fit any make drill press. Use of standard parts and methods reduces initial costs to a minimum.

Ask your local distributor for details or write direct for Bulletin No. 35

ETTCO TOOL COMPANY, INC.

590 JOHNSON AVENUE • BROOKLYN 6, NEW YORK

From The *American Machinist* Library of *Tips for Top Shop Men*

IT'S one thing to hate red tape and paper work, another to do without them. Some of each is necessary, the first to give people time to think, the second to protect you against people who can't.

REMEMBER that your employees' need for recognition is a *continuing* appetite—just the same as their need for food. A morsel once every six months won't satisfy either one.

Accurate grinding is impossible without properly lubricated spindles

You can maintain correct spindle tolerances and reduce down-time, due to faulty lubrication, by using White & Bagley's Spindle Oils . . . developed to meet the requirements of close tolerance spindles.

Backed by more than 40 years' experience in supplying the exact lubrication needs of the grinding machine industry.

Write for "The Lubrication of Grinding Machine Spindles"

THE WHITE & BAGLEY COMPANY
WORCESTER, MASS. • DETROIT, MICH.

Wolverine PLUNGER TYPE TOGGLE CLAMP

W SINCE 1926

FAST • • • ACCURATE • • • POWERFUL

MODEL C-130-A

The combination of a precision ground plunger and an accurately broached hole permits this clamp to be used for locating as well as heavy duty clamping.

IMMEDIATE DELIVERY
Write for catalog.

WOLVERINE TOOL CO.
1484 E. WOODBRIDGE
DETROIT 7, MICH.

A WOLVERINE CLAMP TO SUIT YOUR NEEDS

RUTHMAN GUSHER MACHINE TOOL COOLANT PUMPS

The Right Way to Higher Profits FOR YOU!

You're protecting your production and profits when you use Ruthman Gusher Coolant Pumps on your metal-cutting machinery. Ruthman Gusher Pumps offer you an advanced design that assures you superior performance under the demands of stepped up production. And you know when it's a Ruthman Pump, it's built to last.

Write us today. There's a Gusher type and model to fit your coolant problem.

THE RUTHMAN MACHINERY CO.
1818 READING ROAD, CINCINNATI 2, OHIO

Severance CHATTERLESS TOOLS HIGH SPEED CARBIDE

Winning their way on job after job, they are carefully designed to preclude chatter and can be depended on to produce superior finishes.

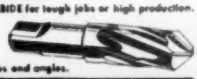
Severance CHATTERLESS COUNTERSINKS

STANDARD TYPE — Stocked in 12 diameters up to 2" and in 30°, 41°, 45°, and 60° angles (with C/I).

Sizes 1" and larger stocked also threaded for shanks — tapered or straight — in various sizes.

Use CARBIDE for tough jobs or high production.

HEAVY DUTY TYPE — Features larger shanks having a long drive. Full range of sizes and angles.



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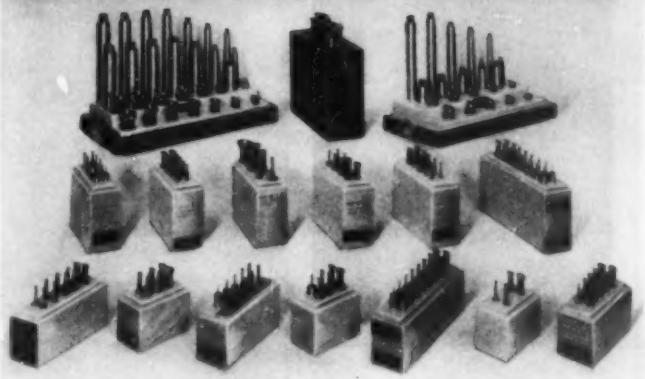

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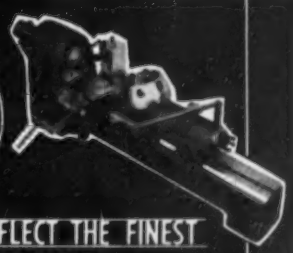

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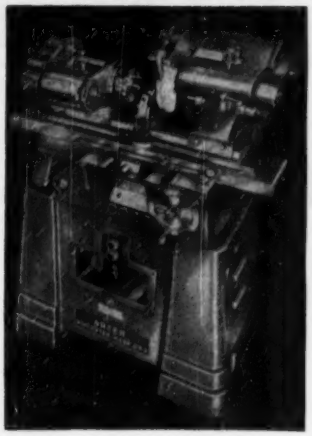

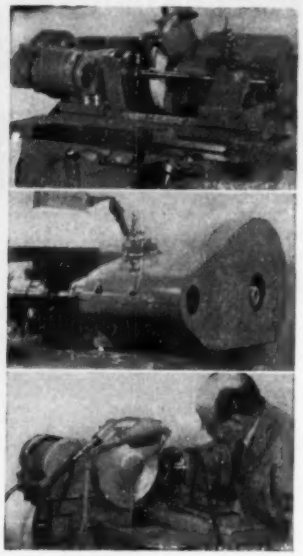

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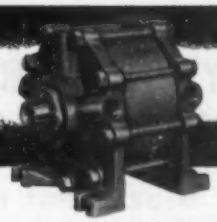

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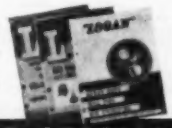

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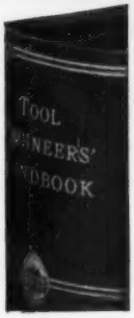

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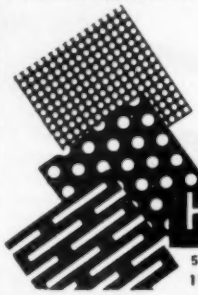

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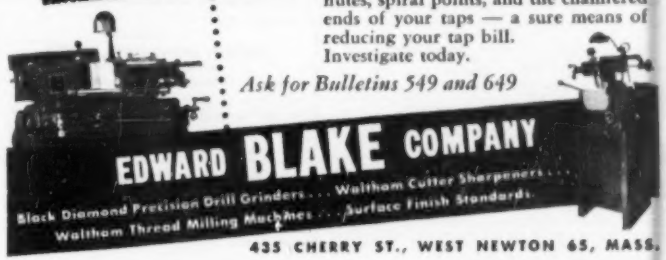

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RADIAL DRILL, Fosdick 5' Arm, 14" Col. #5 M.T.

RADIAL DRILL, Mueller 3½' Arm, 11" Col. #4 M.T. 220, 440 Volts.

RADIAL DRILL, Cinci-Bickford 4' Arm, 13" Col. #5 M.T. 220/440 volts.

RADIAL DRILL, Cinci-Bickford 6' Arm, 13" Col. #5 M.T. 220/440 volts.

RADIAL DRILL, Carlton 4'-15". Motor Dr.

3—SPDLE. DRILL, Leland Gifford #2 MS—14". 11"

3—SPDLE. DRILL, Edlund #2B. #2 M.T. 16". 9½"

4—SPDLE. DRILL, Leland Gifford 20". #2 M.T. 11"

4—SPDLE. DRILL, Demco #KT. #2 M.T. 24".

6—SPDLE. DRILL, Leland Gifford 14". #2 M.T.

DRILL, Avey-Matic #3 Hvy. 2-Spdl. #3 M.T. 24".

DRILL, Cincinnati 21" Bgrd. Drilling & Tapping.

DRILL, Radial, Cinci-Bick. 5' Arm, 13" Col. #5 M.T. 24 speed gearbox. 7½ h.p. 3/60/220.

DRILL, L. Gifford #2MS 14". 11" C.C. 3-Spdle

DRILL, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine. 7½ h.p. 220/440 motor. #5 taper, 12 feeds, 6 speeds, 12½" throat. 3" Capacity in steel.

DRILL, Leland Gifford #2LMS Upright Sliding Head Two Spindle, #2 taper, 13" overhang. Independent 220 volts. 4-speed motors, indicated spindle speeds.

PARTIAL LISTING OF LARGEST STOCK IN THIS AREA

DRILL, Natco #12 Multiple Spindle Motor Driven. #1 taper, 3 h.p. 220/440 motor. Arranged for 18 spindles, Rectangular head, With Natco 24" Rotary Table.

BASE PITCH & SPACE MEASURING MACHINE, #357 Illinois, Late Type—Like New. Capacity—12" diameter gear, 19" between centers. Full Set of Off-Set and Straight Contact Fingers. Dial Indicator. Tailstocks and Leatherette Cover.

SURFACE GRINDER, Horiz. #15 Covel 10½"x17½".

SURFACE GRINDER, Horiz. Leach 6"x12" Hand.

SURFACE GRINDER, Horiz. Thompson 18"x6" Hydraulic.

GRINDER, Cylindrical, Norton 10"x24" Hydraulic.

GRINDER, Cylindrical, Norton 6"x30" Hydraulic.

GRINDER, Cylindrical, B & Sharpe #4 Univ.

GRINDER, Cylindrical, B & Sharpe #10, 6x18.

GRINDER, Cylindrical, B & Sharpe #5, 3x12. Late.

GRINDER, Cylindrical, Cinci, 6x18 Hydraulic.

GRINDER, Cylindrical, Norton 6x18 Hydraulic.

THREAD GRINDER, J & Lamson #TG-615 Automatic. Late Type

GRINDER, Blanchard #16, 26" Chuck Vert Rotary.

GRINDER, Landis Crank 10x32 Hydraulic.

GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.

GRINDER, Cincinnati #EA, 18" x 36" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors, Built-in electrics, Hydraulic infeed.

GRINDER, Norton 6 x 18 Hydraulic Vert. Rotary Auto. Excello Spdle.

GRINDER, Norton 6 x 18 Hydraulic Horiz. Surface. Excello Spdl.

GRINDER, Pratt Whitney 22" Vert. Rotary. 84" table Dwnl.

GRINDER, Bath 10"x25" Motor Driven Universal burrash, 220/440 volts motor with centralized push button controls, Internal Grinder Attachment & steady Rest, etc.

GRINDER, Greenfield #12 Internal Hydromatic 220/440 V.

GRINDER, Heald #79 Internal.

GRINDER, Pratt Whitney 14x36 Vert. Rotary.

GRINDER, Heald #22 & #25 Horiz.

GEAR HOBBER, B & S #14 Spur, 18" dia.

GEAR SHAPER, Fellows #7 High Speed.

KEYSEATER, Mills & Morrill #5 Giant Motor Driven. 220/440 volts motor, Capacity—24" long, 2" wide keyway, Automatic Feed.

LATHE, 10"x8' American Q.C.G. Grd. Hd. 8 speeds.

LATHE, 32"x16' Bridgeford Q.C.G. Grd. Hd.

LATHE, 26"x18' Bridgeford Q.C.G. Grd. Hd.

LATHE, 24"x8' Lodge Shipley, Hvy. Duty.

LATHE, 24"x14' LeBlond Q.C.G. Grd. Hd.

LATHE, 20"x10' American Q.C.G. 72" c.c.

LATHE, 20"x10' Hendey Q.C.G. Taper Att.

LATHE, 20"x8' Lodge & Shipley Q.C.G.

LATHE, 18"x8' Lodge Shipley Q.C.G. Grd. Hd.

LATHE, 16"x6' LeBlond Q.C.G. Taper Attach.

LATHE, 16"x6' Lodge Shipley Q.C.G. Grd. Hd.

LATHE, 14"x6' Hendey Q.C.G. Taper Attach.

LATHE, 14"x6' Hendey Q.C.G. Taper Attach.

LATHE, 12"x5' Hendey Q.C.G. Taper Attach.

LATHE, 10"x24" Logan #820 Q.C.G. NEW

LATHES, Turret, #1 Bardons & Oliver. ¾".

LATHES, Turret, #501 Oster Grd. Hd. 1¼".

LATHES, Turret, #2B Simmons Grd. Hd. 1¼"

LATHES, Turret, #2G Morey Grd. Hd. 1"

LATHES, Turret, #4 W & S Univ. 1½".

LATHES, Turret, #3A W & S Univ. 3½".

LATHES, Turret, #2 Simmons Grd. Hd. 1".

LATHE, American 27" x 10' Grd. Hd. 12 speed. Taper Attach. & Chuck.

LATHE, LeBlond 36" x 30', 220/440 motor, 12 speed head, taper attachment, steady rests, etc.

LATHE, Bridgeford 26"x14' Q.C.G. 8'9" C.C. 220 volts two speed motor.

LATHE, Hardinge #59 High Speed Second Operation Machine. 1" Collet Cap. Automatic Collet Mechanism, collets, collet chucks, etc. FOUR.

LATHE, Monarch 18"x48" Model 4CBB.

TURRET Lathe—Gisholt #4 Univ. Grd. Hd.

TURRET LATHE, Bardons & Oliver #7 Universal Grd Hd. Ram Type. Hydraulic Speed Selector, 2½" Cap. 10 h.p. 220/440 motor, With Chuck, toolholders, etc.

MILLING MACHINE, Vert. #3 Cinci. High Power.

MILLING Machines, Vert. #4 Cinci. High Power.

MILLING Machine, Horiz. #2, #3, #4, #5 High Power.

MILLING Machine, Horiz. #2SP Van Norman.

MILLING Machine, Horiz. &2M Cincin. Univer.

MILLING Machine, Horiz. #3 Kempsmith Univer.

MILLING Machine, Horiz. #4 LeBlond Univ. Hvy.

MILLING Machine, Horiz. #1½ B & Sharpe Univ.

MILLING Machine, Horiz. #2 B & Sharpe Univ.

MILLING Machine, Horiz. #2 B & Sharpe Univ.

MILLING Machine, Horiz. #3 B & Sharpe Univ.

MILLING Machine, Duplex, Cochrane-Bly #14 Univ. Mill & Shaper. #0 Taper Shaper—6" to 6" Stroke. Rotary Table. 220-440 volts.

MILLING Machine, Duplex, Cincin. 24" Automatic.

MILLING Machine, Duplex, Van Norman #2.

MILLING Machine, Cincin. #4—36 Plain Hydmatic

MILLING Machine, Cincin. #4—36 Duplx. Hydmtic.

MILLING Machine, Prod. #1—18 Cinci. Hor. Auto.

MILLING Machine, Prod. #0—6 Cinci. Vertical

MILLING Machine, Prod. #0—6 Cinci. Auto. Horiz.

MILLING Machine, Production, #12 B&S 18" Late Type (6).

MILLING Machine, Prod. #12 B&S 24" Late Type.

MILLING Machine, Horiz. K&T #2B Dble. Overarm. 220/440.

MILLING Machine, Horiz. K&T #3B Dble. Overarm. 220/440.

MILLING Machine, Horiz. Atlas Bench Mill, Like new

MILLING Machine, Horiz. Nichols Hand Millers, late type.

MILLING MACHINE, Cincinnati Vertical #3 H.S. Dial Type. W/Rotary Table.

MILLING MACHINE, U. S. #MMI-0 Cam Controlled Automatic Horizontal. #40 taper, Late Type. 220/440 motors. TWO.

THREAD MILER, Plan-O-Mill #3 Planetary.

PIPE THREADER, Williams #3. 1¼" to 6".

BOLT THREADER, Hill-Acme #1¼-C Sgle. Hd.

TAPPER & THREADER, W & S #11R Dual Radial.

TAPER, W & S #1 Sgle. Spdle.

O.B.I. PRESS, Bliss #21B, 40 tons. 2½" Stroke.

POWER PRESS, Bliss #104 Open Back S.S.S.A. 65 Tons, 6" Stroke.

POWER PRESS, Bliss #84 S.S.S.A. 56 tons, 10" Stroke, 20" between uprights.

POWER PRESS, Bliss #75½ S.S.S.A. 120 tons, 5½" Stroke, 24" between uprights.

POWER PRESS, Bliss #3A S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 30" between uprights.

WHEEL PRESS, Niles B & Pond 200 Tons Hydraulic Horizontal, 48" between struts bars, Two Plunger Type, 7.5 h.p. 220/440 motor.

POWER PRESS Farrasaute #85 Double Crank Sgle. Action, G.G. Geared, 85 tons, 1¾" stroke, Bed area —61½" x 27½".

POWER PRESS — Bliss - Consolidated #162 - B Straight Side Dble. Crank Single Action, 45 tons, 6" stroke, Bed area—24" x 41", 15 h.p. 220 motor.

SHAPER, Vert., Pratt Whitney #B—6" Motor Dr.

SHAPER—Columbia 32" B.G. Crank.

SHAPER—American 24" B.G. Crank.

SHEAR, Gap Squaring Niagara #91268. 10'x¼". Overdrives, 18" Gap, 20 h.p. motor, 220 V. spring hold-down and extra blades.

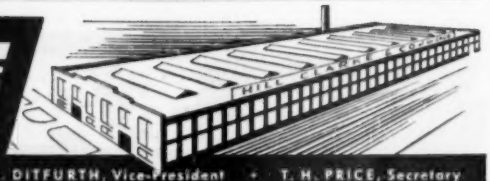
SHEAR, Morgan 120"x¼" Guillotine Plate, 36" Gap.

SHEAR, Quickwork #A-1 Rotary 60" Throat, 18 ga.

WELDER, Federal #712 AT Motor Driven Toggle Action Projection. New in 1936. 200 K.V.A. 10" throat, Stroke—1" to 3". With controls.

WELDER, Federal #624B Hvy. Duty Grd. Type 75 K.V.A. 1½" Stroke. 17" throat. Motor driven

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

AUTOMATICS
No. 49 New Britain, 4 Spdl. Chucker

DRILLS
1, 2, 3, 4, 5, 6 Spdls Leland-Giff., Allen, Edlund, Avays
No. 4BL Natco 36 Spdl. (1943)
No. C225 H Natco—20 Spdls. (1946)
No. 112 Defiance

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1943)
No. 615A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 72 Fellows Gear Shaper
No. 12 Gleason Bevel Gear Generator
No. 13 Brown & Sharpe Spur & Bevel
No. 1 Whiton Auto. Gear Cutter
No. 3 Barber-Colman Hob Sharpener

BORING MACHINES
No. 31 Lucas 3" bar, M.D.
Rockford—3½" Bar
No. 2 Lambert 4" bar
No. 48-B Heald Bore-Matic (1942)
No. DB-112 Excello—Single End—2 Hds.
24" Bullard New Era
42" Bullard New Era
42" King
60" Colburn, M.D.
72" Niles-Bement-Pond
84" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" & 4"x18" Landis, Model H (1942)
6"x18" & 6"x20" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
10"x72" Landis Type C Hydraulic
Norton Motorized Grinders ranging from 6"x18" to 24"x144"
No. 104 Rivett Univ. Gdr. (1943)
No. 5 Bryant Internal Grinder
No. 34 Abrasive Surface Grinder (1943)
No. 22—12" Heald Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 74 Heald Internal (1942)
No. 16—36 Bryant Internal Gdr.
No. 24-26 Bryant Internal Gdr.
No. 81 Heald Centerless Internal

LATHES
16"x8' American Grd. Hd.
18"x8' American, Gdr. Head, M.D.
17"x8' LeBlond, Cone Hd., M.D.
18"x8' American Gd. Hd.
22"—37¾"x48" Centers Monarch (1942)
24"-27"x22' Lodge & Shipley
36"x16" Betts—Bridgeford Grd. Head
19"x22" Sundstrand, Model AA (1943)
20" Fay Automatics (1942)
Model R-14 Seneca Falls Lo-Swing
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 6 Warner & Swasey, Bar Feed
No. 4R Libby (1942)
No. 1A Warner & Swasey, Bar Fd.
No. 4F Fastermatic (1942)

MILLING MACHINES
No. 3B Milwaukee Plain
No. 4 & No. 5 Cincinnati H.P. Plain
No. 3 Cincinnati Universal
No. 5B Cincinnati Vert.
No. 2½-B Milliwaukee Vert.
No. 2 Cincinnati Dial Type Vertical (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cincinnati Mfg. (1942)
No. 2—18" Sundstrand-Electromil (1942)
No. 2—24" Sundstrand Electromil (1942)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 45-48 Cin. Hyd. Tracer (1941)
6"x36" Lees-Bradner—Model LT (1943)
12"x54" H.T. Lees-Bradner Thread Miller (1943)
10"x48" Hanson-Whitney Thread (1942)
48"x24"x12' Ingersoll Slab Miller
36"x24"x12' Ingersoll Duplex Miller (1946)
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)
No. 36—120 Cincinnati Horizontal Hydrotel

MISCELLANEOUS
36" Ohio Shaper
18" Dill Slotter
No. 8 Armstrong Band Saw
10"x10" Rassmussen Saw, Stock Fd.
4" Toledo Pipe Machine (1944)
Micromatic Vertical & Horizontal Hydrohoners

PLANERS
36"x36"x12' Cincinnati
36"x36"x18' Gray Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

LATHE—Engine, Mackintosh-Hemphill, 72"/110"x30' Centers (1943)
VERT. MILL—Cinc. Hydrotel #28/60, 4-spindles, Tracer (1942)
CRANE—150 Ton x 30' span, Whiting, Bridge, plus 2 Aux. Hooks 25 ton.
CRANE—Shepherd 3 Ton x 30' Span Floor Control.

BORING MILLS—D & H 3½" horiz. floor
Vertical Turret Lathe, 30"
Bullard 72", 2 swivel heads on rail (old)

CRANE—Overhead, 3 Ton x 30', floor control

DRILL PRESSES—Minster #2D, 2½" cap. Hvy.
Snyder, 1½", 28" swing

GEAR SHAPERS (2)—Fellows #6

FURNACE CONVEYOR—72"x24"x34' Electric & gas at 900° F.

GRINDER—Surface, Reid Model 2-1 (late)

INDUCTION HEATER—Lepel 7½ KW

LATHES—Engine, Logan 10"x4' cabinet
Engine, Sebastian 16"x36" centers
Turret, Simmons #2B—Bar 1¼"
Turret, Oster #601—1½" cap.
Turret, Foster #1B Universal, Chucker
Turret, Midland #5 Air Chucker (late)

MILLERS—Newton Vert. 42" Rotary Hvy.
Cinc. #3 Vert. Hi Power
Br. & Sh. #3 Universal
Cinc. #08 Vert. (late)

PUNCH—Sg. end, Smith 1-1/16" thru ⅝"

ROLLS, Angle—Bertsch 3"x3"x⅜"

ROLLS, Bending—H. & J. 30"x¼", Pyr.
Southwark 15"x3", Vert.

SHEARS—Square—Famco Power 36"x18g (new)
Alligator—(#2) 24" blade, 3" Rds.
Rotary—Quickwork #50A, 48"x¾" (late)

THREAD MILLS—Morey 12"x10' Centers (late)
Lees-Bradner 9"x36" centers

THREADER—Bolt—Acme 2½" cap.

PRESSES—Z & H #7, 50 ton percussion
Bliss #78½, 450 ton, 18" stroke
W. F. #104A Horiz., 50 ton, shell drawing.

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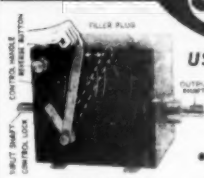
TRiangle 5-5237 Dept. "A"

WAR SURPLUS • BRAND NEW
FINGERTIP SPEED CONTROL HYDRAULIC TRANSMISSION
ORIGINAL COST $428.00
NOW ONLY **54.50** Postpaid



(Item #15)

USE FOR:
- REAMER DRIVES
- CONVEYORS
- MILLING MACHINES
- DRILL PRESSES
- LATHES • PUMPS • GENERATORS
- CANNING MACHINES • GARDEN TRACTORS • FEED MILLS

Variable output speeds ranging from 0 to Input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain setting. Internal relief valves prevent overloading. Use input power of ¾ to 1½ HP.

This Westinghouse—Oil Gear unit converted to commercial use from 40 MM anti-aircraft traversing mechanism, consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finished steel oil reservoir (capacity 2 qts.) Adjustable relief valves set at factory for 100 inch pounds of torque, may be reset up to 180 inch pounds.

Independent reverse control allows full output power and speed selection in either direction of rotation. Input rotation is counter clockwise facing shaft. Recommended input speeds not to exceed 750 RPM. Both input and output shafts measure ⅝" in diameter and include keyway. Overall dimensions 7⅛"x7⅛"x11⅛". Gov't. acquisition cost $428.00. Shipping weight 26 lbs. Complete with 2 quarts of oil and full instructions.

GROBAN SUPPLY CO., Inc. Dept. A-12
1507 S. MICHIGAN AVE. CHICAGO 5, ILL.

No. 4 B & S Automatic, M.D.
No. 21 B & S Mills, M.D.
No. 4A W & S Turret, chucking, M.D.
No. 101 Sheffield Thread Grinder.

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LEAF BRAKE
12'x¼" DREIS & KRUMP. AC MOTOR DRIVE.

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IMMEDIATE DELIVERY — MONEY BACK GUARANTEES

AUTOMATICS
Cone 4 Sp. 1½" Autos.
Fay Automatic, 12"x81".
Lodge & Shipley Duomatic 2A

BORING MILLS
Giddings & Lewis No. 0, No. 25T.
Lucas No. 31, horiz.
Stoker Unit Simplex Double end
Bullard 24", 36", 42" VTL
King 72", 42" vertical

DRILLS AND RADIALS
Carlton 8'-19" column
Canedy-Otto 3'-9" col.
Defiance 112—21" No. 4MT
Fosdick No. 5BM
Sibley 24"-28", Power Feeds
Hamilton, Langelier, Hi-Speed.

ENGRAVERS
Gorton No. 3Z
Deckel, 2 dimen. G1L
Gorton Cutter Grinders 375-2, 265-6.

GEAR EQUIPMENT
Fellows #7, 72, 712, 725, High Speed
Fellows 645Y Spur & Spiral
Gleason #2 Surface Hardener
Gleason 3" Str. Bevel Generator

GRINDERS, MISCELLANEOUS
Brown & Sharpe #5 cyl. 3"x18"
B. & S. Nos. 1, 3 Univ.
B. & S. No .13 Univ. & Tool.
Bryant #16 Internal
Cin. 12x48", Univ.
Covel No. 91A Univ. T. & C.
Dalzen Thread, latest
Gardner #226, 30" Disc.
Hanchett #228 Disc. Dbl. opposed w. M.D. Feed.
Heald 72A3 Sizematic Int. Centerless
K.O. Lee Tool & Cutter.
Landis, 10x24" Type C Univ., 14x36" angular, 10x36" Unit.
Norton No. 2 Tool & Cutter, Hyd.
Oliver 510 Drill Grinder, Sellers 6G, 4G Drill Grinder
Wickman Profile

GRINDERS, SURFACE
Abrasive No. 33, 34 Vert. 8x24.
Blanchard No. 11, 16" Mag. Chuck.
Brown & Sharpe #5, 8x24"
G & L Hyd. #25, 6x18", #45, 12x24".
Heald No. 22 Rotary 14" chuck
Norton 6x18", and 10x36" Hyd.
Reid No. 2A P.F. MIB.
Reid No. 2C Motor Spdl. Hand Feed.
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18"

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21
Cincinnati No. 2-18 Mfg., 50-84 hydromatic
Cincinnati 36-72" horiz. hydrote
Kent Owens IV
U. S. Multimiller, 1 & 2 Spindles
Sundstrand 00 Rigidmills

HYDRAULIC PRESSES
DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR.	OPENING	PLATEN
Lake Erie	500	36"	36"	35 x 36
Watson Stillman Shaft Straightener	500	24"	57"	24" bed
Denison	25/50	18"	23"	22 x 20
Hanslin	50	20"	30"	22 x 30
Southwark, D. A. Clamping Plate	125	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	8"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	10"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	68½"	42 x 32

UP MOVING RAM PRESSES

Waterbury Farrel	800	6½"	28"	22 x 24
Watson Stillman	300	12"	21"	24 x 20
Watson Stillman	300	12"	19"	20 x 20
HPM	180	15"	14½"	30 x 30
Stokes Molding Press & Pump	50	7"	25"	20 x 12
Elmes—With Elec. Plates	50	6"	12"	18 x 18
Stewart Boling	85	10"	19"	20 x 20

WHEEL PRESSES

NILES — 600 ton 96"
500 ton — 48"; 300 ton — 48.

INJECTION MOLDERS

ACCUMULATORS

Mfr.	Size	Pounds
HPM	6" x 9'	2000
General Electric	15" x 11'	400
Watson Stillman (13 gal) Hydr. Pneu.	42 x 9 x 48"	3000

LATHES
Lodge & Shipley, 20"x54" 24 Speed G.H.
Monarch 10"x20" EE.
Rivett 608 QCG, TA, Precision
South Bend Q.C.G. 13"x6', 10"x4'

MILLS, PLAIN AND UNIVERSAL
Cincinnati #3 Plain Hi-Speed Dial Type
Cincinnati No. 3 Plain, 2M Plain
Cincinnati No. 4 Univ. Hi-Power
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee #3K High Speed Dial Type
Van Norman Duplex, 12, 20

MILLS, VERTICAL
Cincinnati No. 4, Hi-Power
Gorton No. 8½ D Profiler
Morey No. 12M Profiler 2 sp.
Sipp MP5 Jig Borer
Pratt & Whitney #2 Jig Borer
Vernon Tool Room Model

PRESSES
Bliss No. 18, 19, 20, 21, OBI.
Bliss No. 304A, 4" Str. 23"x24" bed, S.S.
Bliss No. 650 Hi-Production, 58, 62, 162
Bliss No. 4½ Double Action Cam
Colton Tablet Presses.
Gen. Flexible Screw Press.
Stokes Tablet Presses, Model R & T, DD2.
V&O #01

TURRET LATHES
Acme No. 6 W Bar and Chuck, Acme Fox.
Bardons & Oliver No. 3, 1½" cap., No. 5 Chuck.
Brown & Shrpe 2F
Foster No. 3B.
Gisholt No. 4, Bar and Chuck, 2L, Saddle Type Cross Sliding Turret

MISCELLANEOUS
Band Saw: DoAll 36" Zephyr, Tannewitz No. 36M.
Centering Machine: Sundstrand.
Die Casting Machine DCMT
Hacksaw: Marvel Nos. 6 and 6A, 9A Automatic Feed.
Marking Machine: Noble & Westbrook
Notching Press: Ferracute C82.
Pin Machine: Nilson.
Profilers: Cinn. 360° 4 Sp., Morey 12M
Shaper: Cinn. 24" Universal. Sheldon 12" Brand New.
Rotary Shear: Quickwork 3/16" Cap, 36" throat circle cutting attach.
Honer: Micromatic Hydrohoner, Sunnen.
Keysenters: Mitts & Merrill, Baker, Davis.
Lappers: Ultralap.
Rivet Hammers: Hi Speed.
Shear: 10' x 10 Ga. Niagara
Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz

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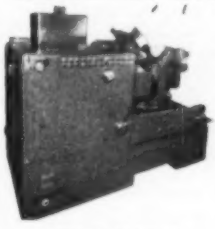
McDONALD
USED MACHINERY

Baush 44" Hvy. Duty Vert. Boring Mill, 2 Hds.
Bullard 30" New Era Vert. Turret Lathe with side head
Hilles & Jones 2" Cap. Guillotine Shear
Brown & Sharpe No. 2 High Speed Vert. Miller, 1942
American 4' Ene. Head Radial Drill 12" col.
Dill 18" Str. A.C. M.D. Vert. Slotter adj. head
G & L and Universal 3" Bar Horiz. Boring Mills
20" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½' Arm Radial Drills
Blanchard M.D. Vert. Sp. Surface Grinder 36" chuck
L & S 20" x 5', 18" x 21', 20" x 10', 28" x 12'
Monarch 20" x 8', Amer. 20" x 12' grd. bd. q.c.g. m.d. Engine Lathes
B & S Nos. 2-B & 3-B, Cin. No. 3 Mil, No. 2-B & 3-B, Cin. No. 5 LeBlond No. 4, Grd. Hd. Plain Millers
B & S No. 2-A & 3-A, Mil, No. 2-B, Cin. No. 1-M, Cin. No. 2 Grd. Hd. Univ. Millers
Avey 2-Spindle MAG Drill Press late.
Cin. 24" M.D. Univ. Shaper.
Cleveland 48" x 12' Table Open-side Planer, 3 Hds.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

we've SPOILED our Customers!



Gleason No. 18 Hypoid Formate Grinder

We've built our business on quality, and OUR customers expect **and receive** the finest tools available.
Our stock is large and diversified; it includes equipment such as these: **five Gleason No. 18 Hypoid Formate Grinders**, for spiral, zerol and hypoid bevel gears. Maximum cone distance 12⅞". Greatest pitch diameter 24". Coarsest diametral pitch 2 D. P. complete.
New in 1948—LIKE NEW, ⅓ of new price. A rare buy—even as stand-by's!

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Tools Machines

LAURENS BROS., INC.
2780 Highland Ave., Norwood
Cincinnati 12, Ohio

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

AUTOMATICS

Ceco No. 3B Automatic, m.d.
No. 2 Swiss Type Wickman, m.d., ½" cap.
4 spindle 1¼" Conomatic, m.d., bar, 1942 machine
4 spindle 1½x4" Conomatic, m.d., bar, 1942 machine
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
20x25" Jones & Lamson, m.d., latest
4 spindle 2¼" Cleveland Model "K", m.d.
2¼" Gridley Single Spindle, m.d.
2½" Cleveland Model A, m.d.
4¼" Cleveland Model A, m.d.
5½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7⅛" Cleveland Model A, m.d.

HORIZONTAL BORING MILLS

No. 0 Giddings & Lewis, m.d., 3½" bar
3½" bar Cincinnati-Gilbert Floor Type, m.d., late type
3½" bar Landis Floor Type, m.d.
4" bar Detrick & Harvey Floor Type, m.d.
No. 45 Giddings & Lewis, m.d., 5" bar
5" bar Barrett, m.d.
5½" bar Niles, m.d.
10" bar Sellers Floor Type, m.d.

VERTICAL BORING MILLS

24" Bullard New Era, m.d., with side head
36" Bullard New Era, m.d., with side head
42" Bullard Spiral Drive, m.d., with side head
42" Colburn, m.d., 1 swivel head, 1 turret head, p.r.t.
42" King, belted m.d., 2 swivel heads, p.r.t.
48" Putnam H.D., m.d., 2 swivel heads
100" Niles Heavy, m.d., 2 swivel heads, p.r.t.
100" Niles Extra Heavy, m.d., p.r.t., late

BROACHING MACHINES

No. 4 Oil Gear Hydraulic, m.d., 64" stroke
75 H.P. LaPointe Hydraulic Horizontal, 150" stroke, 37½ tons cap.
Cincinnati Mill Broach, m.d., 10" spindles, new

BALL BEARING DRILLS

Model D 1100 B Walker-Turner Bench Type, 20" size, brand new
No. ½, 1, 2 Avey, belted m.d.
No. 18 Edlund, m.d., new
No. 2—12" Foote-Burt Single Spindle, m.d.
No. 3 Allen, belted m.d., 12" overhang No. 3 Taper
No. 3 Type B MA6 Avey, m.d., 12" overhang, latest
No. 4 Fosdick, 8" overhang, belted m.d., No. 2 Taper
No. 5BM—24" Fosdick, m.d., latest
No. 5M—16" Fosdick, m.d.
1 spindle No. 3 Avey Type B, style MA6, m.d., No. 3 Taper, latest
2 spindle Avey, size No. 1, Type B, style VHP, m.d., 8" overhang
2 spindle No. 3 Avey, belted m.d., p.f.
3 spindle No. ½ Avey Heavy, direct m.d., latest
4 spindle No. 2 Avey, belted m.d.
4 spindle No. 3 Avey, belted m.d., No. 3 Taper, 12" overhang
6 spindle No. ½ Avey, Model MA8, m.d., latest
6 spindle Leland & Gifford, No. 2 Taper, m.d., on each spindle
6 spindle No. 2B Edlund, m.d., No. 2 Taper
6 spindle No. 3 Avey, belted m.d.
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper

HORIZONTAL DRILLS

Morris Horizontal Mor-Speed, m.d.
No. 1½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 1½Bx50" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
No. 1½ Pratt & Whitney 2 spindle, m.d., older type
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic Drill, belt
2 spindle No. 410 W.F. & John Barnes Deep Hole Drill, m.d.

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, 15 spindles
No. 3 Baush, m.d., 20x40" head, 15 spindles
No. 16 Foote-Burt Fixed Center, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 12" Rockford Gang, m.d.
4 spindle Foote-Burt Rail, No. 4 Taper, m.d.
4 spindle Niles-Bement-Pond H.D. Rail, m.d., 12' rail, No. 5 Taper

THE EASTERN MACHINERY COMPANY
4748 Tennessee Avenue Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

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#50 EXCELLO HEAVY PRECISION THREAD Grinder (Largest made) will Thread 3" shaft any length through spindle, 68" centers 28" swing.

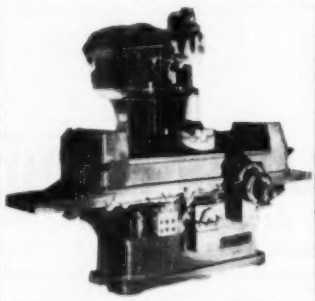
#124 Gardner Dis Grinder with Rotoclone
4 Spdl. Allen Drills Hand Feeds
500 Ton Erie Hyd. press 40x54", 28" st.
8"x108" LoSwing Lathe, AC motors
4—3" Gleason Strait Bevel Gear Generators
Model 61A, 71A, 7A Fellows gear shapers

35/60 Cincinnati duplex hydromatic
14x72" Hill Clarke Norton Grinder.
Model 2L Gisholt 16" turret lathe
45/40 Cinc. tracer controlled hydromatic mill.
BL 2416 Keller Die Sinking Machine
30 HO Baker Drill inverted
10G Sellers single end drill grinder
10x36" Cinc. "EA" Hyd. Cyl. Grinder, late

3" Cleveland 4 spindle Automatic rebuilt 1943
3½" 4 spindle Cone Automatic, 1942
#8 Warner & Swasey turret lathe serial 257,000
Ajax #2 Swedging Press
#31L & 33 & 38 Excello thread grinders
10x18" Landis plunge cut grinder
615 J & L bearing race grinders
8 spindle Footburt rail drill #5 taper heavy duty

#17 Gleason Hypoid Gear Grinder for fast precision finishing of hardened spiral bevel, zerol bevel, & hypoid gears & pinions.

T. R. WIGGLESWORTH MCHRY. CO.
1719 Superior Cleveland, Ohio



P&W 18 x 84" Hyd. Grinder similar to above.

P&W Vert. Hyd. Surface Grinder 18"x84" late type, 75 HP on spdl, in stock	$8500
Cin. #3 Centerless Grinder gd. cond.	1250
Norton Surface Gr. 15"x18"x8", '30 M.D.	4850
Norton Surface Gr. 15"x15"x60" '29 M.D.	4650
Norton Cyl. Gr. 29"x36" '43 Excellent	4750
B&S #2 Univ. Toolroom Gr. rebilt '48	1950
Heald 72-A-5 Gr. new '47, excellent	5850
Bryant #3 & #12 Chucking Grinders $600 &	800

AUTOMATICS

Cleveland Mod. B 3½" '47 used 3 Mo.	12500
Cleveland Mod. A 2", Mod. B 1¼", $1275 &	850
Gibbs, ⅝" Swiss Mod. 32S used 3 Mos.	3450
Orkil Bor. ⅝" new '42 Turret Formers	1000
B & S #2 & #00 Turret Formers Tur. Dr.	1000
	1250
B&S #2 & #00 Wire Feed Sc. Mch. T. Dr.	650
	550
Worrel ⅝" Turret Former new '43 M.D.	950
Davenport Single Sp. '42 Mod. S-1-30	Offers
New Britain Chucking Machines, late	2000

MISC.

Sebastian 16"x36" Gr. Hd. Lathe '43	1250
DCMT Die Casting Machine Mod. M55A, HF	975
Barrett Oil Separator ½ Dia. '46	475
LeRoi-West 24 KVA, 1/60/120 NEW	1250
#10 Gear Hobbers, 10" cap, good cond.	950

EVEREADY SUPPLY CO. E. J. McCallum, Prop.
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Call, Write or Wire GRAFF — Immediate Shipment of Collets, Feed Fingers, Pads & Parts on all Stock Items. Save Money—Save Time —See Us Now!

Used COLLETS

R. A. 6 Gridley Automatics — 1", 1¼", 1⅜", 2", & 2⅜". 1x5 New Britain, Gridley Model F, ¾, ⅞, 1¼, 1⅜, 1¾, 2¼, 2⅜, 3¼, 4¼. Extra large stock of 2⅜, R.A. 6 Gridley pc's and collets. Acme 515 51, 52, 53, 54, 55 and 56, Acme Gridley, Cleveland, Cone, Foster, No. 1, 2, 4, and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Garvin and Britains & Greenlee. Model 60 and 61 New

SPECIAL — Large Stock of Collets, feed fingers and parts for late type 1" and 1⅜" Greenlee Automatic.

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REBUILT TO GUARANTEE
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JOSEPH HYMAN & SONS
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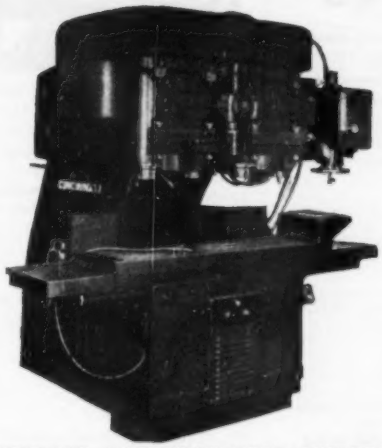
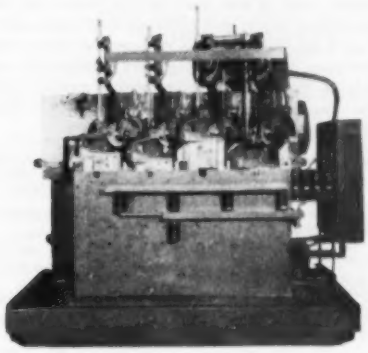
EMERMAN OFFERS FROM STOCK

LATE TYPE MACHINES FOR *SALE* OR *RENT*





CINCINNATI 4-SPINDLE 360° AUTOMATIC PROFILING MACHINE

Table working surface 14"x47¾"
Longitudinal travel of table 12"
Transverse travel of cross-slide 15"
Vertical travel of head 6"
Spindle center distance, center to center 12"
No. 40 National Standard Taper
Diameter of spindle nose 3½"
Diameter of hole through spindle ¾"
Speeds 20, 125 to 3800 RPM
Feeds—Infinite range 1" to 50" per min.
Complete with motors, pumps, piping and all electrical controls. Weight approx. 10,300 lbs.

JUST RECEIVED!!!

12"x102 Lees Bradner, model HT, 6" hole through spindle. 3-jaw universal chuck at each end of spindle. Latest
14"x72" Cincinnati Uni Grinder, latest
#24 Gleason St. Bevel Gear Generator

Davis & Thompson 4 Spindle Rise & Fall Milling Machine built for high production milling of small pieces. Clamping is accomplished by hand. One operator is required for the machine. The table action is such that the operator can go from one table to the next removing pieces and putting in rough castings while the other three tables are working. This machine can also be arranged with power clamping. Productions vary according to the character of the work.

EMERMAN MACHINERY CORP.

870 W. 120th STREET — *CHICAGO 43, ILLINOIS*

4" Bar G. & L. No. 340T Hor. Mill, table type, 48" high, 96" long, table 36"x22". 1942
5' 11" Col. Amer. Trip. Purp. Radial, motor-on-arm 30"x10' Cus. Lodge & Shipley La., T.A., cone, 34" sw.
21" Acme Univ. Brass La., Late
20" Libby "C" Turret, 4½" capty.
No. 5 Mitts & Merrill Keyseater, 3"x24" capty.
BL-3418 Keller, 5 dia., 5 spin., Late
18-36 K. & T. Simplex Miller, 1942
36-90 Cinci. Duplex Hydro. Miller, '42
No. 3 Cinci. Dial Vert. Miller, Late
No. 2M Cinci. Vert. Miller, 1942
No. 2LU Van Norman Univ. Miller, '42
3½" bar #25T G. & L. Table Hor. Bar. Mill
6'17" sel. Carlton Radial, new 1943
5'14" sel. Amer. Tri. Purp. Radial, AC, M.D.
Barnes Combo. Boring & Honing Mach. up to 10' bore x 9" hole, 1942.
12"x39" cen. Pratt Whitney Model B La., '43
14"/19¾"x30" cen. L. & S. Lathe, T.A., '43
14/19½"x34" cen. Bradford La, T.A., '43
40"x29'0" cen. Simmons Lathe, 1942
48"x20' cen. Amer. La., 2 carr., 2 T.A.
19" Geuse Univ. Shaper, '43, gear driv.
20" Smith Mills Univ. Shaper, New
No. 2G Morey Univ. Turret La., New

BENNETT MACHINERY CO.

30 Church St., New York 7, N. Y.
Plant—Route 5-3, Clifton, New Jersey

NEW — SURPLUS

HIGH SPEED S.S. END MILLS TWO & FOUR FLUTE

DIA.	SINGLE END PRICE	SHANK SIZE	DOUBLE END PRICE	SHANK SIZE
1/16"	$1.32	⅛"	$1.97	⅛"
⅛"	1.32	⅛"	1.97	⅛"
3/16"	1.32	⅛"	1.97	⅛"
¼"	1.32	¼"	1.97	¼"
5/16"	1.32	¼"	1.97	¼"
⅜"	1.32	¼"	1.97	¼"
7/16"	1.50	¼"	2.10	¼"
½"	1.65	¼"	2.50	¼"
⅝"	2.15	½"	3.10	½"
¾"	2.65	½"	4.45	½"
⅞"	3.15	½"	5.30	½"
1"	3.45	½"	6.10	1"

All size long Single End Mills in stock. All 32nds sizes up to ½" in stock at next higher list prices.

VICTOR MACHY. EXCH., INC., 251 CENTRE ST., N.Y.C.

OPPOSED HEAD DRILL

FOOTBURT SINGLE SPINDLE HORIZONTAL DRILL, WITH TWO OPPOSED HEADS, WILL DRILL UP TO 3½" CAPACITY. COMPLETE WITH 15 HP DC MOTOR DRIVE. EXCELLENT CONDITION

PRICE $4,500.00

WINSTON MACHINERY CO., INC.
517 South Delaware St., Indianapolis 4, Indiana

SHEET METAL MACHINERY

NEW and USED — HAND and POWER. Apron Brakes, Press Brakes, Shears, Forming Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.

MONA MEMBER

B. D. BROOKS, INC.
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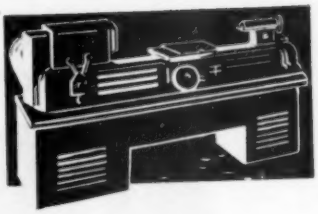
A FAMILIAR NAME IN MACHINE TOOLS

The wide acceptance of the name Motch and Merryweather among users of machine tools is the result of our three way service to industry. First as dependable buyers and sellers of used equipment—second as representatives of some 36 manufacturers of machine tools—third as manufacturers of circular saws, special machines and cutting tools—we have had an exceptionally wide experience in all phases of machine tool design, construction, and sales. You can benefit from this experience by seeing Motch & Merryweather first.



BORING MACHINES
No. 50 Giddings & Lewis Horizontal Mill
42" King Vertical Turret Lathe
52" King Vertical Turret Lathe
14' Niles Tool Works Boring Mill

DRILLS
No. BL-2 Natco Multiple Spindle Drill
4' 12" Column American Radial Drill
6' 17" Column American Radial Drill
No. 2-KH 6-Spindle Allen Drill Press

GRINDERS, CYLINDRICAL
No. 5 Brown & Sharpe Plain Cylindrical Grinder
6"x18" Norton Type C Plain Cylindrical Grinder
10"x36" Model "EA" Cincinnati Plain Cylindrical Grinder
16/20"x72" Norton Type C Cylindrical Grinder

GRINDERS, INTERNAL
No. 16-16 Bryant Int. Hydraulic Hole Grinder
No. 72A3 Heald Plain Int. Hydraulic Grinder
72A5 Heald Plain Int. Hydraulic Grinder

GRINDERS, SURFACE
No. 34 Abrasive Surface Grinder
3B Abrasive Surface Grinder
No. 11 Blanchard High Power Vertical Rotary
No. 22 Heald Rotary Surface Grinder
Model "B" Pratt & Whitney Surface Grinder

GRINDERS, UNIVERSAL
No. 2 Brown & Sharpe Universal Grinder
No. 3 Brown & Sharpe Universal Grinder
10"x36" Norton Universal Cylindrical Grinder

LATHES
No. 3-A Lodge & Shipley Duomatic Lathe
14"x16' Coulter Thread Cutting Lathe
20"x72" Lodge & Shipley Engine Lathe, Model X
Bridgeford 28" Swing x 30' Bed Geared Head

MILLING MACHINES, MANUFACTURING & PLAIN
Model "O" Sundstrand Mill
30"x30"x14' Ingersoll Adjustable Rail Mill
No. 3 Van Norman Plain Horizontal Mill
No. 4 Cincinnati Dial Type Plain Mill
No. 5 Cincinnati High Power Plain Mill

MISCELLANEOUS
No. 6 Fellows Gear Shaper
No. 725 Fellows Gear Shaper
No. 2 Cincinnati Centerless Grinder
36" American "Heavy Pattern" Universal Shaper
No. 214 Besly Disc Grinder
No. 1 Norton Tool and Cutter Grinder

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CLEVELAND DETROIT
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USED MACHINE DIVISION 1350 EAST 222ND STREET EUCLID 23 • OHIO

FOR SALE

LATEST TYPE LIKE NEW

Norton 6" x 30" Plain Cylindrical Grinder with Hydraulic Table & Wheel Head Traverse

H & W 10"x48" Thread Miller

Pratt & Whitney Keller Type "G"

Cincinnati Monoset Tool Grinder

Thompson 30" x 30" x 120" Hydraulic Surface Grinder

Gleason 3" Spiral Bevel Gear Generator

Fellows No. 7-72 High Speed Gear Shaper.

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4" SELLERS Table Type HORIZONTAL power feeds, power—rapid traverse—vertical and cross vernier's—Excellent
24" BULLARD Spiral Drive VERTICAL Thread cutting, Universal for zing attachment—Late Type—Excellent

DRILL
4 Spindle FOSDICK 29" OX COLUMN #4 and #5 M. T. Spindles—Late—Excellent

GRINDERS
#2 CINCINNATI CENTERLESS Filmatic Late
6 x 18 NORTON Hydraulic plain PLUNGE TYPE —Late type
14"x16"x60" GALLMEYER & LIVINGSTON, SURFACE with chuck, 10 HP Late—Excellent

LATHES, TURRET
#3 WARNER & SWASEY Universal 2 Spindle mater. Bar Feed. Chuck LATE TYPE
#7 BARDONS & OLIVER, Universal BAR FEED, 12 SPEED, LATE TYPE
#5 BARDONS & OLIVER, Universal Chucker. Late Type
#4A WARNER & SWASEY—9" HOLE, SADDLE TYPE, 25 HP. Tooling 3 Chucks, Late Type
#1A WARNER & SWASEY—3" HOLE Saddle Type—10 HP—Late Type

MILLERS
HANSON WHITNEY 8 x 16 Thread with Relieving. Late Type

PROFILER
PRATT & WHITNEY #12B Two spindle

TAPPER
BAKEWELL #1 and #2

UNITED MACHINERY & TOOL CORP.
85 Central St., Worcester 8, Mass.

HORIZONTAL BORING MILL

5" bar SELLERS FLOOR TYPE HORIZONTAL BORING MILL. New in 1942. 8' vertical travel of head on column. 10' horizontal travel of column on runway. 10' x 12' floor plate with outboard support.

O'CONNELL MACHINERY CO.
1825 NIAGARA ST. BUFFALO 7, N.Y.

QUALITY MACHINES

Abrasive Cut-Off, 302 Campbell, Hydraulic Feed, MD.
Bolt Threader, 1½" Landmaco, L.S. M.D.
Grinder, 25A Heald Hyd., 16" Chuck. MD.
Grinder, 10 HP. Standard D.E. 3/60/220
Lathe, 12"x54" Monarch, Tool Room, MD.
Miller, 0-8 Cin. Plain Automatic MD.
Miller, 3-36 Cincinnati Hydromatic. MD.
Nipple Machine, 1½" Landmaco. MD.
Press, 8-10 Ton V. &O. Motor 360
Shaper, 36" Cin. Universal, P.D.F. MD.
Stenciling & Knurling Machine, Hand.
Turret, 3-F. Fastermatic Automatic, MD.

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Immediate Delivery—Unconditionally Guaranteed.
EVERY MAKE—EVERY TYPE—EVERY AGE
We Purchase One Machine or Entire Plants.
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Surplus • Assorted • Quantities
- M.R.C. 8214FF \ Bore 70 MM or 2¾ in.
- S.K.F. 103410 / O.D. 125 MM—4-59/64 in.
- Bower B-1704 / Width 29 MM or 25/32 in.
- NEW, 9,800 in original boxes, Burbank Whse.

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CHarleston 0-1539 HEmpstead 5746

#217 BAKER DRILL PRESSES
SINGLE SPINDLE, WITH POWER FEED. #5 MORSE TAPER, TABLE 17½" x 23". SERIAL NOS. 11087 AND 11095.
EXCELLENT CONDITION.
PRICE ..... $1,500.00 Ea.
WINSTON MACHINERY COMPANY, INC.
517 South Delaware St., Indianapolis 4, Indiana

LATEST TYPES — GUARANTEED MACHINE TOOLS 1941-1950 MODELS

MILLING MACHINES
CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables.
CINCINNATI: #2M Vertical, Rotary table, P.F.
CINCINNATI: D-8 Vertical
SUNDSTRAND: 96 Rigidmil—Duplex (for milling cam tracks in propeller hubs or similar work)
SUNDSTRAND: #00 Rigidmil—Hydraulic
SUNDSTRAND: #0 Rigidmil
MOREY: 12M 2-spindle Profiler
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" Table, power feed
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller

THREAD MILLERS & TAPPERS
MOREY: 12"x60" Thread Miller
LEES BRADNER: 40A Thread Miller
LEES BRADNER: LT 0x36" Thread Miller
HALL PLANETARY: B, C & D Thread Millers
MUNCHEY: #22 Tapper, Horizontal
PRODUCTO: Hand Tapper
NATCO: Vertical Tapper 16 spindle

TOOL SHARPENERS
OLIVER: 2A Face Mill Grinder
OLIVER: 510 Drill Sharpener
OLIVER: 10" Tool Bit Grinder Template Type
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-wheel grinder 3 HP

GRINDERS—THREAD
EXCELLO: #31 & #33 External
JONES & LAMSON: TG648 External
JONES & LAMSON: TG1245 External

GRINDERS—CYLINDRICAL
NORTON: 6"x18", & 10"x16", Plain
NORTON: 10"x18" 45° angle wheel head
NORTON: 12"x36" Universal
LANDIS: 18"x18" "C" Plain Hydraulic
LANDIS: 18"x32" Type "O" Crankpin, Hydraulic
CINCINNATI: #2 Centerless
CINCINNATI: 6"x18" Hydraulic Filmatic
BROWN & SHARPE: #10 & #21 Plain

GRINDERS—INTERNAL
BRYANT: #5 and #5V Internal
BRYANT: 10C16 Internal
HEALD: #55 Planetary
HEALD: 70A Plain Universal
HEALD: 72A5 T-bed, Universal
HEALD: 72A3, 72A5 Plain & Universal
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 Sizematic for Cylindrical Cams
BRYANT: 112 Universal, Hydraulic
BRYANT: 10-28 Hole Grinder
RIVETT: #104 Tool Room Universal

GRINDERS—RADIUS
VAN NORMAN: 27S, 63S, 64S Oscillating
VAN NORMAN: #3½ Universal

GRINDERS—SURFACE
THOMPSON: 8"x12"x18" Type B
THOMPSON: 12"x18"x96" Type C
HEALD: Rotary 8" dia. chuck
HEALD: #22 Rotary—12" Chuck
GARDNER: 120A Opposed Head Disc

HONING & LAPPING
BARNES: 300 H Vertical Honing
MICROFATIC: H-310 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal
NORTON: #26C and 26F Hyprolaps
NORTON: #2F×40" Diameter Lapper
SCHRANER: External Cylindrical Lapper with six Heads Model A

GEAR & SPLINE GRINDERS
PRATT & WHITNEY: 10" single & double wheel
GEAR GRIND MACH: GG-10 (10"x24"). Hydraulic Spur Gears & Splines also internal
GLEASON: #17 Spiral, Zerol & Hypoid Bevel
MAAG: S530 11¾" diameter

GEAR CUTTING MACHINES
BARBER-COLMAN: #3 Hobber
BROWN & SHARPE: #6 Cutter—72" diameter
CLEVELAND: #140 Hobber—1 spindle
FELLOWS: 6Z2 Shaper
FELLOWS: 6L, 6LA, 6SA, 7 & 72 Gear Shapers
FELLOWS: Straight Line Generator
GLEASON: 3" Straight Bevel Gear Generator
GOULD & EBERHARDT: 12M Hobber, 18" dia.
GOULD & EBERHARDT: 36BM Cutter
HAMILTON: #1 Hobber 6" diameter
SYKES: Gear Machinery (all sizes)

GEAR FINISHERS & TESTERS
FELLOWS: 8LB1 & 13LB1 Gear Lappers, External & Internal, Spur & Helical
FELLOWS: #12-C Spacing Tester
GLEASON: #13 Universal Gear Tester
GLEASON: #4 & #6 Bevel Gear Testers, Hand & Power Operated
GLEASON: 3" Bevel Gear Tester

PRECISION BORING
BARNES: #412 Horizontal 60" Travel
HEALD: 48A Single End 2-spindle
HEALD: 47A Single End 2-spindle
HEALD: 46B Double End Borematic

LATHES—PRODUCTION
POTTER & JOHNSTON: #4D Automatic
SUNDSTRAND: 8x15 Auto. Lathes
LODGE & SHIPLEY: #3A Duomatic
LIPE-ROLLWAY: 13"x30" Carbomatic
LEBLOND: 25"x48" Engine Lathe, raised to 40"

LATHES—TURRET
BULLARD: 24", 36" Vert. Spiral Drive
WEBSTER & BENNETT: Vertical Turret Lathes 36", 48" and 60" sizes
GISHOLT: No. 4 Ram Type
GISHOLT: 2L Saddle Type, Extended Bed
HERBERT: Turret Lathes (all sizes)

DRILLING MACHINES
AVEY: #2 Deep Hole Hydraulic
LELAND-GIFFORD: #2LWS Deep Hole Vertical
BARNES: 28½ 2 spindle on 4 spindle base
BAKER: 30HO 2 spindle inverted 4" dia. cap.
BAKER: 21T Upright Heavy Duty 2" dia. cap.
FOSDICK: #48M Upright High Speed
PROVIDENCE ENG: 6-spindle ¾" capacity
PRATT & WHITNEY: ½-Dx50 Deep Hole Reamer
ARCHDALE: Radial, all sizes (New)

MISCELLANEOUS
CINCINNATI: 2-36 Broaching Machine
BLOUNT: Polishing Lathes 12x48
GARDNER: #6 Disc Grinder—20" 10 HP
ALLEN: #2 Stud Setter
CAMPBELL: #425 Abrasive Cutstator
WILLIAMS: 10" Pipe Cut-Off
TANNEWITZ: GM-36 Hand Saw High Speed
KENT: 3½" Bar Pointer and Chamfer
MATTHEWS: 79A Marking Machine
GENERAL: #35 Flexible Press
DENISON: 91S-AM Hydr. Test Stand
OSBORN: 60" Jolt Rammer for Foundry
GENERAL ENGR.: Rivetor 24" throat
ILLINOIS: 514 Center distance & concentricity checker
ILLINOIS: 604 Bevel Gear Hand Rolling Fixture
ILLINOIS: #224 Involute Checker and Recorder
RED RING: 8IC-12" Gear Tester
FELLOWS: #6M Red Liner

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Milling Machines—No. 1 Universal. No. 1 American (new) plain. No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36" Surface 12"x60", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—10"x6', 3', 10'—18"x6', 8' 10'—26"x10'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized. Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 2"x24"—5"x30" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¾" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote Burt No. 25 24" Hi Duty 2" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty joiner, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saw; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88 **Columbus 16, Ohio**

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AUTOMATICS
No. 40 New Britain Chucker, 1941.
20"x25" Fay Automatic, 1943.
No. 12"x21" Fay Automatic, 1942.

BORING MACHINES
No. 48 Heald Single End, 1943.

DRILLS
No. 26HO Baker, 1942.

GEAR EQUIPMENT
No. 6 Gleason Revacycle, 1941.
No. 6 Gleason Testers, 1943.
8" Red Ring Internal Shaver, Late.
No. GCL-5 Red Ring Shaver, 1942.
No. 645A3 & 61A Fellows Gear Shaper, 1942.
No. 72 Fellows Shaper, 1943.
Red Ring Univ. Checker.

GRINDERS, CYLINDRICAL
16"x36" Cincinnati Plain, 1942.
14"x30" Landis Plain, 1943.
12"x36" Landis Univ. 1941.
10"x18" Norton Plain, 1942.
6"x30" Landis Plain, 1942.

GRINDERS, SURFACE
30"x24"x192" Mattison, 1943.
14"x36" Pratt & Whitney, 1943.
8"x24" Thompson Hyd. 1942.

GRINDERS, INTERNAL
No. 24-36 Bryant Hyd. 1943.
No. 172 Heald Gap. 1940.
No. 72A3 & A5 Heald Rotary, 1943.
No. 73 Heald Hydraulic, 1942.

GRINDERS, THREAD
No. 35L Excello, 1943.

LATHES, ENGINE
18"x129" Lehmann, G.H.
16"x54" Reed-Prentice, 1942.

LATHES, PRODUCTION
No. 3 FU Foster "Fastermatic", 1942.
No. 3A L&S "Duomatic," 1943.
8"x108" Lo-Swing Semi. Auto. 1942.
14"x42" Monarch "Magna-Matic," 1941.

LATHES, TURRET
No. 1L Gisholt, 1943.
5⅛"x24" Acme Univ. 1943.
No. 5.0 Acme Univ. 1942.
No. 3R Gisholt, 1943.
No. 1H-5 Libby, Late.
No. 6R Denver, 1942.
No. 3 Bardons & Oliver.

MILLS, PRODUCTION
No. 34-36 Cincinnati, 1942.
No. 1-18 & 2-24 Cincinnati, 1942.
No. 1-14 Kent Owens, 1942.
No. 12 Brown & Sharpe, 1942.

MILLS, THREAD
6"x16" Lees Bradner, 1942.

MILLS, UNIVERSAL
No. 3 Cincinnati, D.T. 1945.
No. 2MH Cincinnati, 1942.

MILLS, VERTICAL
No. 4H Milwaukee, 1942.
No. 8½ D Gorton, Late.

PRESSES
300 Ton Lake Erie, Hyd. 1945.
50 Ton Denison, Hyd., Str. 1942.
56 Ton Niagara O.B.I. Late.

SHAPERS
20" Cincinnati Plain, Late.
6" Pratt & Whitney, 1942.

WELDERS
150 KVA Federal Seam, 1943.
60 KVA Sciaky Spot, New.

Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

PRECISION BORERS

Two No. 2112 Excello single end, 2 spindle
One No. 112C Excello single end
Two No. 218 Excello heavy, double end
One No. 42 Heald heavy 2 spindle, work rotating type

HORIZONTAL BORING MILLS

3" bar Universal, No. 3A
3¼" bar Lucas, No. 32
4" Niles Bement Pond floor type
4½" bar Lucas, No. 33
5" bar Jones planer table type

VERTICAL BORING MILLS

24" Bullard vertical turret lathe
38"-44" Niles vertical turret lathe
52" King
84" Gisholt
100" Niles Bement Pond extra heavy

GEAR HOBBERS

No. 12 & type T Barber Colman
No. 8H, 12H, 16HS & 18H Gould & Eberhardt
No. 130 Cleveland Rigidhobber
Nos. 1 & 5A Lees Bradner
No. 7125A Fellows gear shaper

GRINDERS, CYLINDRICAL

6"x18", 10"x18", 10"x36" & 14"x36" Landis hydraulic
10"x20", No. 1 Brown & Sharpe universal
6"x18" No. 10 & 6"x32", No. 11 B & S mechanical
10"x24" & 16"x72" Landis mechanical
10"x36" Norton hydraulic semi-automatic
10"x18", 10"x30" & 10"x50" Norton mechanical
12"x36" Cincinnati Filmatic universal

GRINDERS, SURFACE

Nos. 10, 16 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
16" & 24", No. 25A Heald rotary
8" Pratt & Whitney rotary (tub)
8"x24", No. 34 Abrasive vertical
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
8"x22", No. 3 Abrasive

GRINDERS, TOOL & CUTTER

K.O. Lee universal
Oliver template tool bit
Nos. 1 & 4T Sellers
Gisholt for lathe & planer tools
No. R6 Keller radius tool
No. 47 Excello carbide tool
18" Whitney wet tool
No. 13 Brown & Sharpe univ.
30" Ingersoll face mill

ENGINE LATHES

14"x6', 18"x6' & 20"x8' Lodge & Shipley
16"x5' & 16"x6' Sebastian
16"x10' American
18"x8' Rockford
25"x48" centers Leblond
26"x120" centers Wickes
30"x16' Leblond
36"x108" centers Bridgeford
40"x80" centers Leblond

MILLERS, KNEE TYPE

Nos. 2AS & 3B Milwaukee plain
No. 3 Van Norman duplex
No. 3 Oesterlein
No. 3 Cincinnati vertical
No. 3H Kearney & Trecker vertical
No. 3 Cincinnati HSDT vertical
No. 3 Kempsmith Maximiller vertical
No. 4 Cincinnati High Power vertical
Nos. 1-12 & 1-18 Cincinnati production

SHAPERS & PLANERS

16", 20", 24" & 28" G. & E. shapers
20" & 24" Gemco univ. shapers
24" Columbia univ. shaper
16" Bement Miles slotter
30"x24"x6' Liberty openside planer
36"x36"x8' Gray planer
48"x48"x12' Cleveland openside planer

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Box 770 SAGINAW, MICH.

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LATHES

MONARCH 20"x72" centers model "M", 16-Speed Gr. Hd. 22½" swing, Monarch auto. sizing controls. (late)
MONARCH 27"x30" ctrs. Model "N", actual swing 36½", (late type) (1945 machine)
PRATT & WHITNEY Model "B" 16"x36" Motor-in-base
PRATT & WHITNEY 16"x54" ctrs. Model "C" (late type)

NILES-BEMENT-POND 48"x30' centers — quick change gr.—gr. hd. heavy duty, A.C. motor drive—2 carriages—taper attachment—power rapid traverse—16 spds. 2.04 to 90 RPM—(late type)

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TURRET LATHE

WARNER & SWASEY #4 Pre-selector Hd. universal, swing 18½", max. turning length 29"—bar feed & chucking—tooling, (late)
MOREY 26 Ram type plain, BG motor-in-base (late type) hole in spindle 1-9/32"—chuck cap. round 1", hex. ⅞"—wire feed
OSTER #60IWD motor-in-base Turret Lathe—(late type), auto. chuck cap., round 1½", square 1-1/16", hex 1-5/16"—wire feed.

MILLERS — UNIVERSAL

BROWN & SHARPE #1A Double overarm motor-in-base, wkg. table 11¼"x41¾"—range 22"x9"x18".
CINCINNATI #2MH Universal, motor-in-base, (late type)—tbl. size 58"x18½".

GRINDERS

NORTON 6"x18" type "C" plain hydr. cylindrical, oscillating spindle (late type)
ARTER GRENBY EG-103 external and internal 3"x9" cap. internal grinding attachment (1948 machine)

HEALD #52 Cylinder Grinder (late) complete with motors and starting equipment—cap. 4" minimum dia. to 18" max. dia.

HEALD #70A internal Grinder (late type)—swing 13¾"—max. dia. hole ground 9½".

TOOL & CUTTER GRINDERS

NORTON #2 Universal Hydr. Tool & Cutter, 1945 machine, complete with M.D. Universal workhead and attachments.
NORTON #1 Tool & Cutter Grinder (late type), with workhead and footstock—attachments (1941 vintage)

GEAR CUTTERS

GLEASON 5" M.D. straight bevel gear generator, late.
FELLOWS #72 M.D. Hi-speed external and internal spur gear Shaper, late, 7" dia. x 1½ face cap.
GLEASON 11" Gear Generator (quantity of tooling)

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NEW 250 Ton BLISS Knuckle Joint Press. M.D.

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Nos. 2K and 3H K&T Vertical Millers.

No. 2BL NATCO "Holesteel" Multiple Spindle Drill, rectangular head.

No. ½B P&W Two Spindle Reaming Machine.

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36" x 36" x 12'
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Adjustable rail, three heads, 40 HP AC Motor Drive. Excellent condition.
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Model W-7 BAUSH Hydraulic Multiple Spindle Drills.

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No. 145 CLEVELAND Rigid Hobber.

No. 12 FELLOWS Gear Shaver.

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#35 Landis Horizontal Boring Mill, 3½"
8' American Triple Purpose Radial Drill
#174 Heald Internal Grinder
36/90 Cincinnati Hydromatic Duplex Miller
612A Fellows Gear Shaper
28/120 Cincinnati Horizontal Hydrotoo Miller

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8 Spindle speeds. 6¼" hole in spindle. 18" 3- and 4-jaw steel body chucks, swing over ways 24", quick change gear, taper attachment. Large assortment of turret tools. Condition like new.

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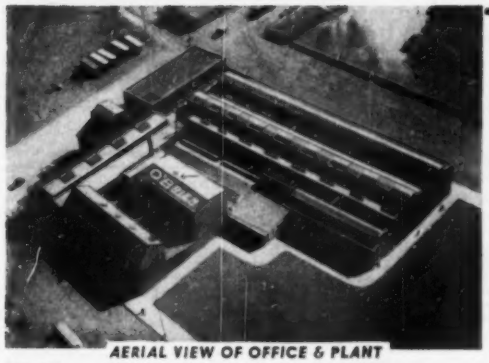

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48"x26' c.c. American "Super Productive," lathe.
‡1-18 Cincinnati automatic miller, climb attachment, '41.
27"/58" x 12' c/c LeBlond sliding gap lathe.
20"x48" Springfield lathe, motor in base.
2—‡2B Brown and Sharpe pl. millers, motor in base.
2—‡5 Midland Universal turret lathes, preselect., '43.
2—‡2 Simmons turret lathes, p. feed, '43.
3" Gleason bevel gr. generator, '42.

36"x36"x14' CINCINNATI "HYPRO" PLANER

‡34 Abrasive Vert. Surface Grinder, late.
6"x18" Norton Surface Grinder, late.
‡2A Brown and Sharpe Univ. Mill, Timken, M. in base.
2—16"x10' Lodge and Shipley lathes, taper, M. in base.
‡45 Giddings and Lewis 4½" horiz. mill.
3" Universal horiz. boring mill.
‡2MS Leland Gifford 3 spdle. drill.
6" Oster "Rapiduction" pipe threader, M.D.

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16"x60" PRATT & WHITNEY Toolroom Lathe
20"/40"x14' RAHN LARMON Geared Head Sliding Bed Gap Lathe, taper, chuck, etc.
24"x24' LODGE & SHIPLEY Lathe, 18' centers
7D JONES & LAMSON Flat Turret Lathe, pre-selector head, 1942
Model R-14 SENECA FALLS "Lo-Swing" Lathe, 16"x40", automatic timing, 1941
No. 1L GISHOLT Turret Lathe, with cross sliding turret and taper attachment, Timken spindle, hardened ways
6A POTTER & JOHNSON Automatic Chucker
No. 12 BROWN & SHARPE Automatic Milling Machine, 1942
No. 2M CINCINNATI Universal Mill, rectangular overarm, motor in base, dividing head
No. 3V REED PRENTICE Vertical Mill
No. 3I LUCAS "Precision" Table Type Horizontal Boring Mill, 3" bar
84" CONSOLIDATED COLBURN Vertical Boring Mill, 2 swivel heads, rapid traverse, AC—MD
No. 5 GALLMEYER & LIVINGSTON 12"x30" Surface Grinder
5"x40" Type C LANDIS Semi-Automatic Hydraulic Camshaft Grinder
No. 2 NORTON Tool & Cutter Grinder, 1943
72A3 HEALD Internal Grinder, 1948
27"x36" AMERICAN Wheelabrator Tumblast Machine, 1945
No. 7 FELLOWS Gear Shaper, 1943
1½"—6" JARECKI Pipe Machine, 1943
No. 6 BROWN & SHARPE High Speed Automatic Screw Machines, Turret drives, serial nos. 6613, 7048, 6850
Model 60 NEW BRITAIN Automatic Screw Machine, 1" capacity
No. 710D NIAGARA Double Crank Press
75 ton HENRY & WRIGHT Dieing Machine, with roll feed, 3½" stroke
No. ½ BUFFALO Universal Ironworker, with coper & notcher
84"x22"x12' NILES BEMENT POND Planer, 4 heads, DC reversing motor drive

O'CONNELL MACHINERY CO

SIMMONS ENGINEERED Machine Tool REBUILDING NEWS

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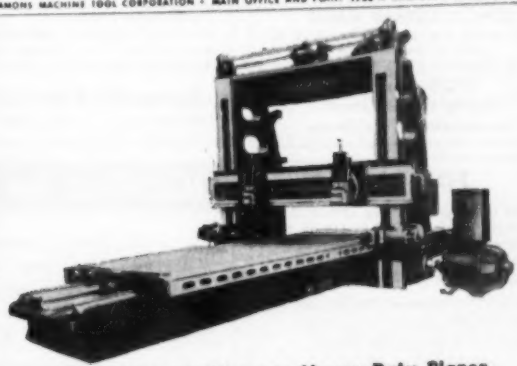

136" x 96" x 30' Simmons Heavy Duty Planer, four heads, Power rapid traverse, Forced feed lubrication, Herringbone gear train, Cutting speeds 19 to 115 FPM, 230 volt D.C. Planer Type Reversing Motor and Pendant Control Station. Inspect at Albany.

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ALL NEW 1942-1946

No. 22 MURCHEY BOLT & PIPE THREADER: New 1940, Long bed, 1"-1½" U.S.S. Ser. No. W-8407

MILLS

No. 5-50 HP C&M K. & T. PLAIN: Dble. Overarm 18"x94" tbl., NEW 1944. Ser. No. 1-5136
No. 4M K. & T., PLAIN: 1000 RPM, NEW 1942
No. 3K K. & T., PLAIN: Dble. Overarm, 64"x15½" tble, 1500 RPM, NEW 1943
No. 12M MOREY 2 SPDLE PROFILER: 12¾"x 15" tble., NEW 1943. Ser. No. M-1084.

GRINDERS

12"x36" NORTON HYD. CYL. UNIV., NEW 1943 Serial No. L1432
No. 72A-3 HEALD INTERNAL: Hyd. Feed, Raised Head & Spdle., Cross Sliding Head and Spdle. NEW 1943
No. 72A-5 HEALD INTERNAL: Hyd. Feed, Raised Head and Spindle, Cross Sliding Head and Spindle, New 1943
No. 33 EXCELLO EXTERNAL THREAD: NEW 1943 6"x18", Serial No. 5191

SHAPERS

20 GOULD & EBERHARDT UNIV. INDUSTRIAL TYPE TOOLROOM: NEW 1943
12" VERNON, V Type Ram, NEW 1943

LATHES FLOOR

22"x96" CENTERS MONARCH: 16 Speed Grd. Hd., NEW 1946. Serial No. 28683
10" MODEL "EE" MONARCH TOOLROOM: 20" Centers, NEW 1943 (6) Serial No. 23224, etc.

TURRET LATHES

No. 2S MOREY RAM TYPE, Bar Feed, NEW 1943 (2)

DRILLS

26" RPMster; BUFFALO; All Grd. Sgle. Spdle.; No. 3 M.T. Power Feed

PLATING EQUIPMENT

5000 AMP HANSON VAN WINKLE MUNNING PLATING GENERATOR 8 Volts, NEW 1943
2000 AMP HANSON VAN WINKLE MUNNING PLATING GENERATOR 3-40 Volts, NEW 1941, Ser. No. 10851
1000 AMP CHANDEYSON PLATING GENERATOR, 40 Volts, NEW 1943
500 AMP HANSON VAN WINKLE COPPER OXIDE RECTIFIER
2 TON CRANE, INDUSTRIAL Twin Hook, 24' Span NEW 1943
42"x32"x70" PLATING TANK
OTHER NUMEROUS HEATED TANKS AND BLOWERS

No. 306 RACINE Shear Cut Hyd. Hack Saw: NEW 1945, Cap. 10"x13"

AIR COMPRESSORS

MODEL C CLASS WN-114 SULLIVAN: Radial Type; 14½x8¾x7"; Coupled M.D. with 250 HP 440V synchronous mtr., with exciter lubricator and control panel, inter-cooler, after-cooler, NEW 1943

SPOT WELDERS

100 KVA, Type P2-36-R8 FEDERAL UNI-PULSE Air Press Type, NEW 1943

MISCELLANEOUS

No. FB-18 GROB FILER, 18" Throat, NEW 1943
ORTON WOOD SHAPER, 1000 RPM, 60"x40" Tble. NEW 1943
DE WALT RADIAL SAW, 33x48" Table
ROGERS Table Saw
No. 232 OLIVER Tilting Arbor Saw, 33x34" Tble., 3" Cap., NEW 1943
5000 LB. WEST BEND Hydraulic Lift Trucks
3500 LB. BARRET Lift Trucks, NEW 1943 (11)
JEFFREY SANDITIONER, Cap. 10-15 Ton, NEW 1944

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GRINDING WHEELS FOR TOOL & CUTTER GRINDERS

PLATE MOUNTED

Size 10" x 2" x 5"
Silicon Carbide—Grits 60-100-120—Hardness H & I

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Lucas #43 Precision, Table Type Boring Mill 5" Bar, Table 36"x72"
Heald No. 49 Borematic, 2 Spindle Hydraulic Cross Table
Fisher, 5" Bar Floor Type Horizontal Boring Mill, AC-DC Drive
Gorton 3L—Three Dimensional Pantograph with Cutter Grinder
Bliss O.B.I. & Double Crank Presses
U. S. Tool Nos. 22, 25, 33 Multi-Slides
NILSON & BAIRD FOURSLIDES

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POWER PLATE BENDING ROLL

10 feet by ⅝" inch capacity, Solid end housing top roll 15", bottom roll 12"

PRICE $1250

Bullard 72" vertical boring mill, 2 rail heads (swivel type), motor driven 20 hp. 220/3/60, 1 set of 4 jaws.

PRICE $1750

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FOR SALE

2 Used Universal Threading Spindles complete for 1⅝" or 2¼" Model 61 New Britain Gridley Automatic Screw Machine. Like new.
2 Used 1-1/16 National Acme Die Heads
1 Used 1⅝" National Acme Die Heads
1 Used 1-9/16" Geometric Die Heads
1 Used 1¼" Geometric Die Heads

Complete with Chasers

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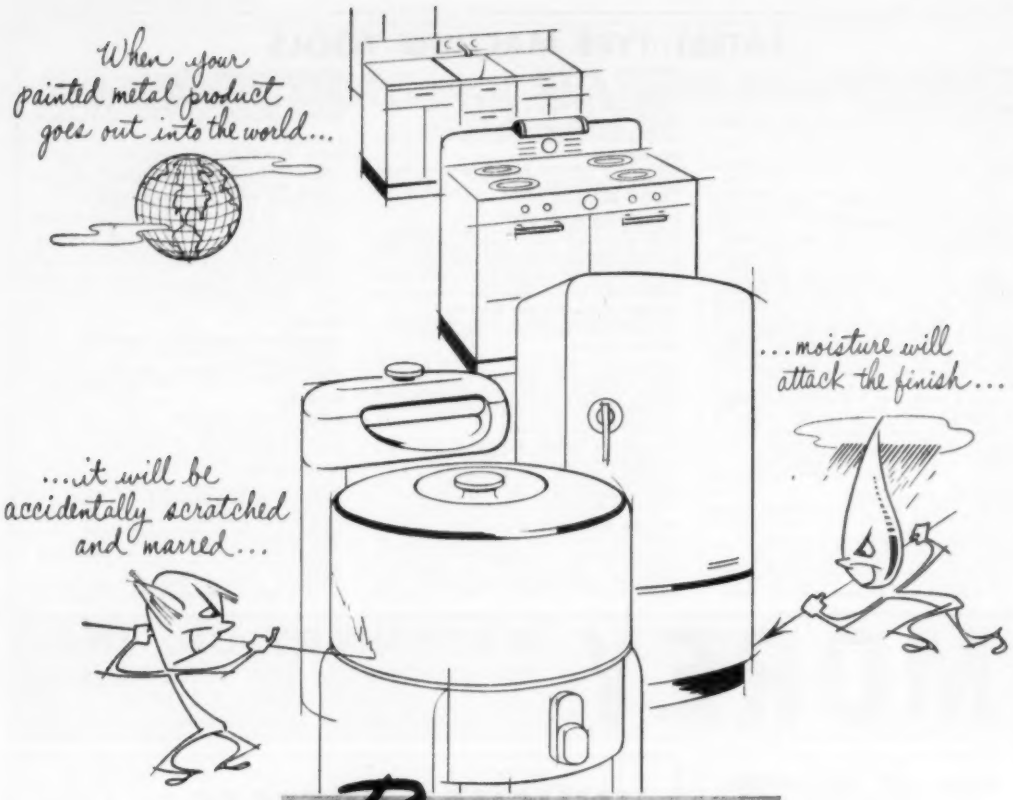
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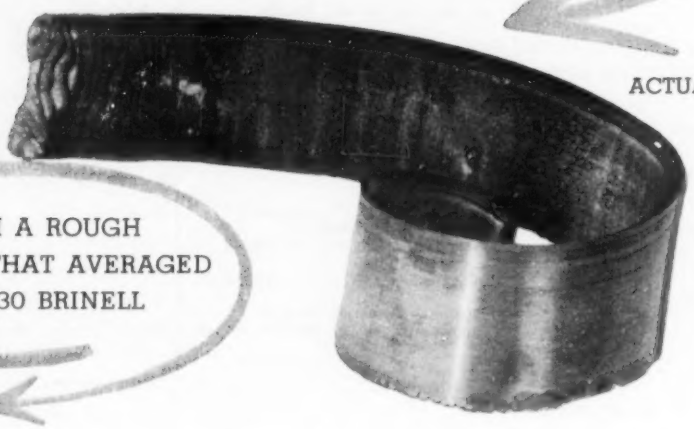

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If you need

PRECISION GROUND SURFACES

See the complete line of Grand Rapids Grinders

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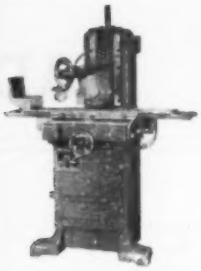
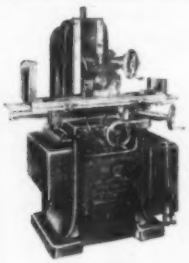
In small job shops and in America's largest industrial plants, more and more Grand Rapids Grinders are delivering tool room accuracy with micro-inch finish at production speeds. Your inquiry about surface grinders or cutter grinders, tap grinders, drill grinders or combinations, will receive prompt attention.

GALLMEYER & LIVINGSTON CO.
330 Straight Ave., Grand Rapids, Mich.



No. 20
Grand Rapids Hand Feed Surface Grinder
Size 6" x 10" x 18"



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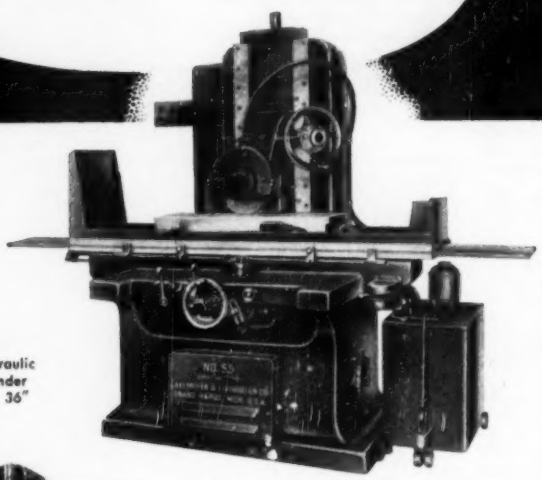
Size 6" x 10" x 18"



No. 55
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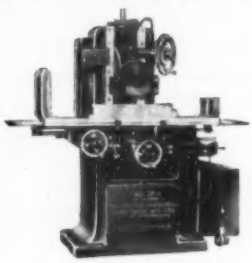
Size 12" x 17" x 36"



No. 35
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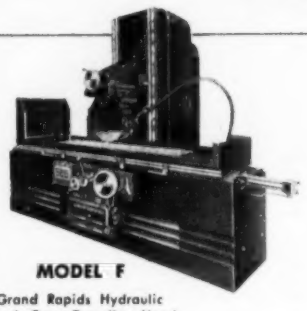
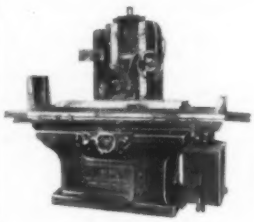
Size 8" x 12" x 24"



MODEL F
Grand Rapids Hydraulic Feed, Cross Traveling Head Surface Grinder
Size 16" x 25" x 48" to 24" x 25" x 96"

GRAND RAPIDS GRINDERS



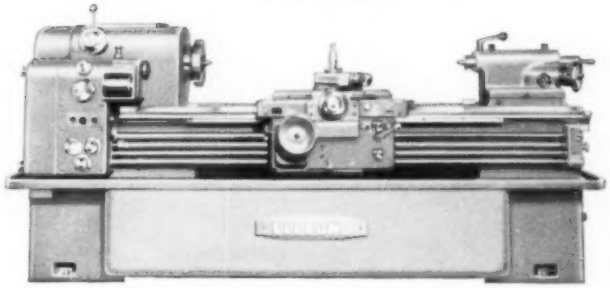
No. 65
Grand Rapids Hydraulic Feed Surface Grinder
Size 12" x 17" x 48"

you don't need

attachments

to do most toolroom jobs

on the . . .



LeBLOND RT TOOLROOM LATHE

Standard features of LeBlond's RT replace most toolroom attachments, eliminate a bushel of change gears.

And you save hours of set-up time!

Just flick levers and turn dials to get spindle speeds as low as 6, as high as 1500 r.p.m. Make simple, quick adjustments for course threads down to 4″ lead—American, diametral, module and metric pitch threads. RT also gives you exclusive, time-saving 4-directional rapid traverse to make *every* job easier.

The most versatile taper equipment in the business may be specified (at extra cost) with your new RT—to give you steep tapers up to 50° included, shallow tapers up to 48″ long.

LeBlond also builds the RT in a 16″ Heavy Duty Engine model —with 16 single-lever controlled speeds from 30 to 1537 r.p.m. 4-directional rapid traverse. Reverse to leadscrew at apron. Automatic chasing stop.

Sixty-three years of machine tool leadership stand behind LeBlond's complete line of 76 lathe models to give you day-in, day-out dependability. Your nearby LeBlond Distributor will tell you about the RT and other late models. Call him or write—

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

Sales offices in New York, Chicago, Detroit

LeBLOND RT Toolroom

RT

built-in features

4-directional rapid traverse

Combination belt and gear drive

Automatic chasing stop

Reverse to leadscrew at apron

Single-lever positive-jaw feed control

Automatic lubrication through headstock, feed-box, apron

toolroom lathe

Variable speeds—6 to 1500 r.p.m.

90 feeds—.0007″ to 2.064″

90 threads—¼ to 120, American, module, diametral, metric

Start-stop-reverse spindle control at apron

7½ horsepower motor

engine lathe

16 speeds—30 to 1537 r.p.m.

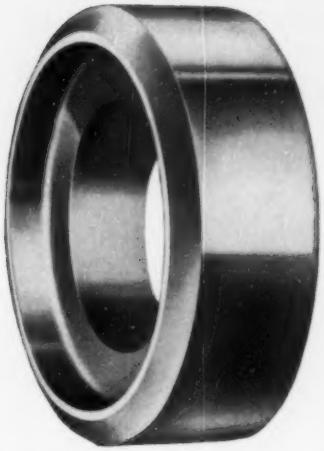
60 feeds—.0013″ to .230″

60 threads—2 to 120

15 horsepower motor

World's largest builder of a complete line of lathes

Now they make it for 14% less, thanks to TIMKEN® tubing



WHEN made from bar stock, this automotive part cost $150.90 per thousand. By switching to Timken® seamless tubing, the manufacturer was able to use boring tools in place of twist drills and to increase speed and feeds. This boosted production from 96 to 144 pieces per hour, with the cost savings shown here:

	BAR STOCK	TIMKEN TUBING
Material cost per 1000 pieces...	$83.19	$84.71*
Machining cost per 1000 pieces (6 spindle 2⅝" capacity automatic screw machine with estimated operating cost of $6.50 per hour)	$67.71	$45.14
TOTAL COST...	$150.90	$129.85

AMOUNT OF SAVING: $21.05, or 14%

* In most cases, Timken seamless tubing is lower in cost than bar stock, foot for foot. In this instance, it was slightly higher because of the extremely great wall thickness.

Hundreds of manufacturers of hollow cylindrical parts are reducing their costs anywhere from 10% to 35% by switching to Timken seamless tubing. Timken tubing eliminates drilling because the hole is already there. Finish boring is often your first production step. You have less stock to machine—less scrap loss. Machining cycles can be shorter, speeds and feeds increased.

Product quality is higher when Timken tubing is used. Dimensional control and finish of parts is better because internal flooding of working tools makes for cooler metal temperatures. And since the piercing process by which Timken seamless tubing is made is basically a forging operation, you get fine forged quality in your hollow parts. From tube to tube and heat to heat, this fine forged quality is always uniform because of Timken's rigid quality control.

EXTRA SAVING WITH TIMKEN TUBE ENGINEERING SERVICE

To get the most economical size tube for your job, guaranteed to clean up, use our Tube Engineering Service. With the tube we specify, you waste no time or material machining away excessive stock. Yet you're sure of enough metal to fill out your dimensions. It's *guaranteed.* For an analysis of your requirements, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.